



HEWLETT  
PACKARD

## **OPERATOR'S HANDBOOK**

# **8568B SPECTRUM ANALYZER**

**Includes Options 001, 010, 400, 908, and 913**

### **SERIAL NUMBERS**

This manual applies directly to Model 8568B RF Sections with serial numbers prefixed 2408A and IF-Display Sections with serial numbers prefixed 2403A.

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1212 VALLEY HOUSE DRIVE  
ROHNERT PARK, CALIFORNIA 94928, U.S.A.**

**MANUAL PART NO. 08568-90045  
Microfiche No. 08568-90049**

**Printed: JUNE 1984**



## MANUAL UPDATING SUPPLEMENT

\*\*\*\*\* MANUAL IDENTIFICATION \*\*\*\*\*  
\*  
\* Instrument Model Number: 8568B \*  
\* Manual Part Number: 08568-90045 \*  
\* Manual Print Date: March 1984 \*  
\* Manual Title: Operator's Handbook \*  
\*\*\*\*\*

### ABOUT THIS SUPPLEMENT

The information in this supplement is provided to correct manual errors and to adapt the manual to instruments containing changes made after the manual print date.

Change and correction information in this supplement is itemized on separate pages corresponding to the original manual pages. The pages in this supplement are organized in numerical order by manual page number, and are to be inserted in the manual either to supplement or replace the original manual pages.

Manual updating supplements are revised as often as necessary to keep manuals as accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies, quote the model number, print date, and part number listed at the top of this page.

### HOW TO USE THIS SUPPLEMENT

Insert this title page in front of the manual title page.

Insert the change pages in this supplement into your manual adjacent to the original pages.

Insert any complete replacement pages provided into your manual in the proper location. The original pages may be discarded or left intact to document all instrument configurations.

Manual Updating Changes Date:  
14 AUGUST 1985



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# ADDENDUM

## \*\*\*\*\* ADDENDUM COVERAGE \*\*\*\*\*

This supplement adapts your Manual Updating Supplement to instruments with serial numbers prefixed through:

- RF Section: All Serials
- IF Section: 2648A

## \*\*\*\*\* MANUAL IDENTIFICATION \*\*\*\*\*

Instrument Model Number: 8568B  
Manual Part Number: 08568-90045  
Manual Print Date: March 1984  
Manual Title: Operator's Handbook

## ABOUT THIS ADDENDUM

ADDENDUM contains important information of the kind normally contained in the attached Manual Updating Supplement, but received too late to be included. Use the ADDENDUM to correct your manual in the same way you use the Manual Updating Supplement.

## SPECIFICATIONS TAB

PAGE 19:

### EMI

2648A & Above  
Change the EMI specification to read:  
Conducted and radiated interference is within the requirements of MIL-STD 461B, Part 2 (CE03) and Part 7 (RE02) and within the requirements of CISPR Publication 11 and Messemppfaenger-Postverfuegung 526/527/79 (Kennzeichnung Mit F-Nummer/Funkschutzzeichen).

ADDENDUM Date: 23 JANUARY 1986  
For MANUAL UPDATING SUPPLEMENT  
Dated: 14 AUGUST 1985



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PAGE 3:

All Serials

### SPECIFICATIONS TAB

#### Frequency Reference Error

Change the Frequency Reference Error specification to read:

Frequency Reference Accuracy:

Aging Rate:  $<1 \times 10^{-9}$ /day and  
 $<2.5 \times 10^{-7}$ /year

Warm-up time (after less than 24 hours with line power disconnected)<sup>1</sup>:  
less than 72 hours to meet aging rate specification.

Warm-up time (after line power disconnected indefinitely)<sup>1</sup>:  
30 days to meet aging rate specification.

Temperature Stability:

$<7 \times 10^{-9}$  over the 0° to 55°C range

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<sup>1</sup>Line voltage disconnected without power to the frequency reference. When the analyzer is in "standby," the frequency reference temperature is maintained at a steady state.

Frequency accuracy is then subject to standard instrument warm-up period indicated in the General Specifications section.

[NOTE: Changes in line voltage, gravitational field and other environmental conditions will affect the frequency reference accuracy.]





### SAFETY SYMBOLS

The following safety symbols are used throughout this manual and in the instrument. Familiarize yourself with each of the symbols and its meaning before operating this instrument.



Instruction manual symbol. The instrument will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the instrument against damage. Location of pertinent information within the manual is indicated by use of this symbol in the table of contents.



Indicates dangerous voltages are present. Be extremely careful.

#### CAUTION

The CAUTION sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

#### WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

### GENERAL SAFETY CONSIDERATIONS

#### WARNING

**BEFORE THIS INSTRUMENT IS SWITCHED ON**, make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact. Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.

#### WARNING

There are voltages at many points in the instrument which can, if contacted, cause personal injury. Be extremely careful. Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

#### CAUTION

**BEFORE THIS INSTRUMENT IS SWITCHED ON**, make sure its primary power circuitry has been adapted to the voltage of the ac power source. Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

## **LOCATING OPERATING INFORMATION**

Included with the HP Model 8568B Spectrum Analyzer are three manuals: The Operator's Handbook, the Operating and Programming Manual, and the Tests and Adjustments Manual. Not included with the instrument, but available at no charge upon return of the enclosed order card, is the two volume Troubleshooting and Repair Manual.

### **OPERATOR'S HANDBOOK (HP part number 08568-90045)**

#### **Contents:**

General Information, Installation, Quick Reference, Specifications, and Operation Verification. Available as separate publications are the Specifications (HP part number 08568-90046), Operation Verification (HP part number 08568-60008), and a pocket sized version of the Quick Reference Guide (5955-8970).

### **OPERATING AND PROGRAMMING MANUAL**

(HP part number 08568-90041)

#### **Contents:**

Manual and remote operation, including complete syntax and command description. Accompanying this manual is the separate, pocket sized Quick Reference Guide (HP part number 5955-8970).

### **TESTS AND ADJUSTMENTS MANUAL**

(HP part number 08568-90051)

#### **Contents:**

Electrical performance testing and adjustment procedures.

### **TROUBLESHOOTING AND REPAIR MANUAL**

(HP part number 08568-90043)

#### **Contents:**

IF-Display Section and RF Section service information.

## SUMMARY OF OPERATOR'S HANDBOOK

### General Information



General information regarding safety, German x-ray radiation notice and license, instrument identification, manual updating, and a listing of available accessories and options.

### Installation



Information regarding initial inspection, preparation for use, power selection, mating connector guide, and installation procedures.

### Quick Reference

Information to allow the experienced operator to find the specific program codes either alphabetically or by function. Also available as a pocket sized booklet (HP part number 5955-8970).

### Specifications



A listing of the spectrum analyzer specifications. Also available separately (HP part number 08568-90046).

### Operation Verification

The program disc and operating information for running the automatic Operation Verification. Also available separately (HP part number 08568-60008).



# **GENERAL INFORMATION**

## **INTRODUCTION**

This HP 8568B Operator's Handbook contains the following five sections: General Information, Installation, Quick Reference, Specifications, and Operation Verification. The Operation Verification, Specifications, and Quick Reference Guide (pocket size) are also available as separate publications.

## **SAFETY**

Before operating this instrument, you should familiarize yourself with the safety markings on the instrument and the safety instructions in the manuals. The instrument has been manufactured and tested in accordance with international safety standards. However, to ensure safe operation of the instrument and personal safety of the user, the cautions and warnings in the manuals must be followed. Refer to the summary of the safety information located near the front of this handbook.

## **INSTRUMENT IDENTIFICATION**

Attached to the rear of each section of your instrument is a serial number plate. The serial number is in two parts. The first four digits and letter are the serial number prefix; the last five digits are the suffix. The prefix is the same for all identical instruments; it changes only when a production change is made to the instrument. The suffix, however, is assigned sequentially and differs for each instrument. The contents of the manuals for the HP 8568B apply to instruments with the serial number prefix(es) listed under SERIAL NUMBERS on the title page.

## **MANUAL UPDATING**

An instrument manufactured after the printing of one of the manuals may have a serial number prefix not listed on the title page. An unlisted serial number prefix indicates the instrument differs from those described in the manual. The manual for the newer instrument is accompanied by a manual updating changes supplement.

To keep the manuals as current and accurate as possible, Hewlett-Packard recommends you periodically request the latest Manual Updating Changes supplement. Each manual has a separate supplement identified by the manual print date and part number. Copies of the supplements are available at no cost from any Hewlett-Packard office.

## **EQUIPMENT AND ACCESSORIES AVAILABLE**

### **Computers**

The HP 8568B is fully HP-IB programmable. Consult your local HP Field Engineer for recommended controllers and available software. For a list of equipment required for Operation Verification, refer to the Operation Verification Manual.

### **HP 85650A Quasi-Peak Adapter**

The HP 85650A adds to the spectrum analyzer the resolution bandwidth filters and quasi-peak detection capability specified by CISPR. Together the quasi-peak adapter and the spectrum analyzer provide many of the elements needed for an EMI receiver system.

### **Troubleshooting and Repair Manual**

Service information for the HP 8568B is available in this manual (HP part number 08568-90043). It includes schematic diagrams, block diagrams, component location illustrations, circuit descriptions, repair procedures, and troubleshooting information.

### **Service Kits**

Service accessories packages for the HP 8568B are available for convenience in troubleshooting and instrument alignment. These kits include a test cable and extender boards.

Service Kit for HP 8568B: HP part number 08568-60001

Service Kit for HP 8566B and HP 8568B: HP part number 08566-60005

## **OPTIONS**

### **Electrical**

- 001 75 ohms input impedance (SIGNAL INPUT 1)
- 400 400 Hz Power Line Frequency Operation

### **Documentation**

- 080 Information Cards in Japanese
- 081 Information Cards in French

### **Rack Mounting Kits**

- 908 Rack Mount Flange Kit (to mount without handles)
- 913 Rack Mount Flanges with Handles (handles already provided)
- 010 Rack Mount with Slides (with or without handles)

## X-RAY RADIATION NOTICE

### ACHTUNG

Model 85662A

### WARNING

Während des Betriebs erzeugt dieses Gerät Röntgenstrahlung. Das Gerät ist so abgeschirmt, daß die Dosisleistung weniger als 36  $\mu\text{A/kg}$  (0.5 mR/h) in 5cm Abstand von der Oberfläche der Katodenstrahlröhre beträgt. Somit sind die Sicherheitsbestimmungen verschiedener Länder, u.A. der deutschen Röntgenverordnung eingehalten.

Die Stärke der Röntgenstrahlung hängt im Wesentlichen von der Bauart der Katodenstrahlröhre ab, sowie von den Spannungen, welche an dieser anliegen. Um einen sicheren Betrieb zu gewährleisten, dürfen die Einstellungen der Niederspannungs- und des Hochspannungsnetzteils nur nach der Anleitung des Handbuches vorgenommen werden.

Die Katodenstrahlröhre darf nur durch die gleiche Type ersetzt werden.

Das Gerät ist in Deutschland zugelassen unter

der Nummer: BW/50/79/RÖ

When operating, this instrument emits x-rays; however, it is well shielded and meets safety and health requirements of various countries, such as the X-ray Radiation Act of Germany.

Radiation emitted by this instrument is less than 0.5 mR/hr at a distance of five (5) centimeters from the surface of the cathode-ray tube. The x-ray radiation primarily depends on the characteristics of the cathode-ray tube and its associated low-voltage and high-voltage circuitry. To ensure safe operation of the instrument, adjust both the low-voltage and high-voltage power supplies as outlined in the Tests and Adjustments manual (if applicable).

Replace the cathode-ray tube with an identical CRT only.

Number of German License: BW/50/79/RÖ

FIGURE 1. X-RAY RADIATION NOTICE





**MINISTERIUM  
FÜR ARBEIT, GESUNDHEIT UND SOZIALORDNUNG  
BADEN-WÜRTTEMBERG**

Ministerium für Arbeit, Gesundheit und Sozialordnung Baden-Württemberg  
Postfach 10890 - 7000 Stuttgart 1

Firma  
Hewlett-Packard GmbH  
Herrenberger Str. 110

7030 Böblingen



Stuttgart, den 22. Januar 1981

P am Eingang 8  
im Innenhof

Fernsprecher  
Durchwahl (07 11) 66 73- 7357

Aktenzeichen: VII/6-3400.2.2/7/  
(Bitte bei Antwort angeben) Fa. Hewlett-  
Packard; Böbl./80

Betr.: Durchführung der Röntgenverordnung (RöV)  
Bezug: Ihr Antrag vom 20. November 1978 - US/iw -

Zulassungsschein Nr. BW/50/79/Rö

Hiermit wird Ihnen gemäß § 7 Abs. 2 der Röntgenverordnung  
vom 1. März 1973 (BGBl. I S. 173) die Zulassung der Bauart  
des nachstehend beschriebenen Störstrahlers erteilt:

Gegenstand:	Sichtgerät für Spektrumanalysator
Firmenbezeichnung:	Typ 85662 A
Kathodenstrahlröhre:	Hewlett Packard Typ 5083-5791
Hersteller:	Hewlett Packard, Santa Rosa Div., 1400 Fountain Grove Parkway, Santa Rosa, California 95404, USA
Betriebsbedingungen:	Hochspannung: max. 24,4 kV Strahlstrom: max. 7,5 $\mu$ A

Dienstgebäude: Rosehölblplatz 30 (Ref. Gruppe III R - Sicherheit in der Kerntechnik - Lange Straße 4 A)  
Fernsprecher Vermittlung (07 11) 66 73-0 · Telefax (07 11) 61 01 13 · Telex 722 548

**Bauartunterlagen: Bauartzeichnungen:**

Nr. B-5083-5700-3 Rev. A vom 15. Dez. 1977,  
Nr. B-5061-0195-1 Rev. F vom 8. Sept. 1977,  
Nr. C-2000-0105-1 Rev. D vom 18. April 1977,  
Nr. A-5060-9708-1 Rev. C vom 22. Juli 1975.

Operating and Service Manual  
Nr. 08568-90005 vom Juni 1978

Materialangaben vom 3. Juli 1979

**Prüfungsschein:** Physikalisch-Technische Bundesanstalt  
Braunschweig  
Nr. 6.32-S 80 vom 18. September 1979

Die Zulassung wird befristet bis 22. Januar 1991. Auf § B  
Abs. 2 RöV wird hingewiesen.

**Für den Strahlenschutz wesentliche Merkmale**

1. Die Art und Qualität der Kathodenstrahlröhre,
2. die der Hochspannungserzeugung und -stabilisierung dienenden Bauelemente.

**Auflagen:**

Die Zulassung wird gemäß § 8 Abs. 1 der RöV mit folgenden Auflagen verbunden:

1. Die Geräte sind einer Stückprüfung daraufhin zu unterziehen, ob sie bezüglich der für den Strahlenschutz wesentlichen Merkmale der Bauartzulassung entsprechen. Die Prüfung muß umfassen:
  - a) Kontrolle der Hochspannung an jedem einzelnen Gerät
  - b) Dosisleistung nach näherer Angabe der Zulassungsbehörde.

---

Die Ergebnisse der Dosisleistungsmessung sind, den Herstellungsnummern der Geräte zugeordnet, aufzuzeichnen, 3 Jahre aufzubewahren und der Zulassungsbehörde auf Verlangen einzusenden.

Die Zulassungsbehörde ist berechtigt, einzelne Geräte nach eigener Auswahl anzufordern, um das Vorliegen der für den Strahlenschutz wesentlichen Merkmale zu überprüfen oder überprüfen zu lassen. Die Geräte sind auf Verlangen im Originalzustand anzuliefern und angemessene Zeit zur Verfügung zu stellen.

2. Die Herstellung und die Stückprüfung sind durch einen von der Zulassungsbehörde bestimmten Sachverständigen überwachen zu lassen.
3. Die Geräte sind deutlich sichtbar und dauerhaft mit dem Kennzeichen

BW/50/79/Rö

zu versehen sowie mit einem Hinweis folgenden Mindestinhalts:

"Die in diesem Gerät entstehende Röntgenstrahlung ist ausreichend abgeschirmt. Beschleunigungsspannung maximal 24,4 kV."

4. Jedem Erwerber eines Geräts ist ein Abdruck des Zulassungsscheins auszuhändigen, auf dem das Ergebnis der Stückprüfung (Auflage 1) bestätigt sein muß.

Jedem Gerät ist ferner ein Betriebsanleitung beizufügen, in der auf den in Auflage 3 genannten Hinweis aufmerksam gemacht wird und die die für die Durchführung von Reparatur- und Wartungsarbeiten notwendigen Sicherheitsmaßnahmen bezüglich des Strahlenschutzes enthält:

---

Hinweis für den Benutzer des Geräts:

Unesachgemäße Eingriffe, insbesondere Verändern der Hochspannung oder Auswechseln der Kathodenstrahlröhre, können dazu führen, daß Röntgenstrahlung in erheblicher Stärke auftritt. Ein so verändertes Gerät entspricht nicht mehr dieser Zulassung und darf infolgedessen nicht betrieben werden.



*Detting*  
Dr. Detting

Dieses Gerät wurde nach den Auflagen der Zulassungsbehörde einer Stückprüfung unterzogen und entspricht in den für den Strahlenschutz wesentlichen Merkmalen der Bauartzulassung. Die Beschleunigungsspannung beträgt maximal 24,4kV.

**NOTE**

Relevant information previously contained in the Operating and Service Manual is now contained in the Tests and Adjustments Manual (HP part number 08568-90051) and the Troubleshooting and Repair Manual (HP part number 08568-90043).

Hewlett-Packard Company  
Signal Analysis Division  
1212 Valley House Drive  
Rohnert Park, CA 94928

# INSTALLATION

## INITIAL INSPECTION

Inspect the shipping containers and the cushioning materials for damage. If there is any, they should be kept until the contents of the shipment have been checked mechanically and electrically. If there is any damage or defect to the instrument sections or accessories, report it to the nearest Hewlett-Packard office. The HP office will arrange for repair or replacement without waiting for claim settlement. Keep the shipping materials for inspection by the carrier.

In the shipping containers is an accessory package. This contains two power cords, two fuses, one Type N Male to BNC Female adapter, and two instrument interconnect cables. Also included (already attached to the instrument) are cables W37 and W38.

### NOTE

**Cables W37 and W38 are only removed for connection of the IF and VIDEO ports to the HP Model 85650A Quasi-Peak Adapter. If the analyzer is used without the HP 85650A Quasi-Peak Adapter, W37 and W38 must be connected for the analyzer to operate.**

## PREPARATION FOR USE

### Operating Conditions

The instrument may be operated in temperatures from 0°C to +55°C, at altitudes up to 4,572 meters (15,000 ft.).

### Physical Specifications

Figure 1 shows the dimensions of the combined instrument sections. Allow an additional 100 mm (4 inches) clearance at the rear of the instrument for the interconnect cables.

As the combined weight of the instrument sections is approximately 100 pounds, use appropriate caution when moving or installing.

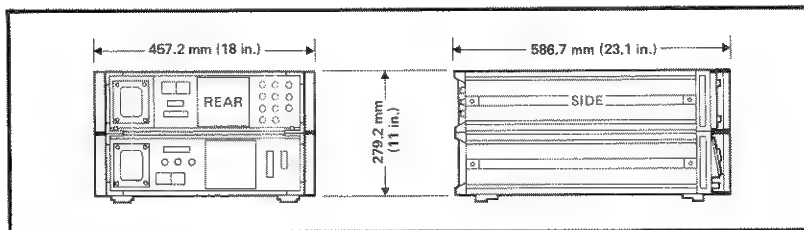


FIGURE 1. PHYSICAL DIMENSIONS WITH HANDLES

### Interconnection of Sections

Place the RF Section right side up on a level work surface. Place the IF-Display Section on top of the RF Section, offset far enough forward to allow the RF Section hooks to engage the IF-Display Section frame when slid back. When the rear panel lock feet line up, tighten both lock foot thumb screws. (If the instrument is to be rack mounted with slides, the left slide panel should be changed before the interconnection — see the instructions for rack mounting with slides in this guide.)

### Cable Connections

As shown in Figure 2, connect cable W30 between IF-Display Section J1 and RF Section J1. Connect cable W31 between IF-Display Section J2 and RF Section J4.

### Power Requirements

The HP 8568B requires a power source of 100, 120, 220, or 240 Vac + 5% – 10%, 50–60 Hz. Power consumption for each instrument section is less than 250 volt-amperes.

### Line Voltage and Fuse Selection

#### WARNING

**BEFORE SWITCHING ON THIS INSTRUMENT, make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact. Any interruption of the protective (grounding) conductor inside or outside the instrument, or disconnection of the protective earth terminal, can result in personal injury.**

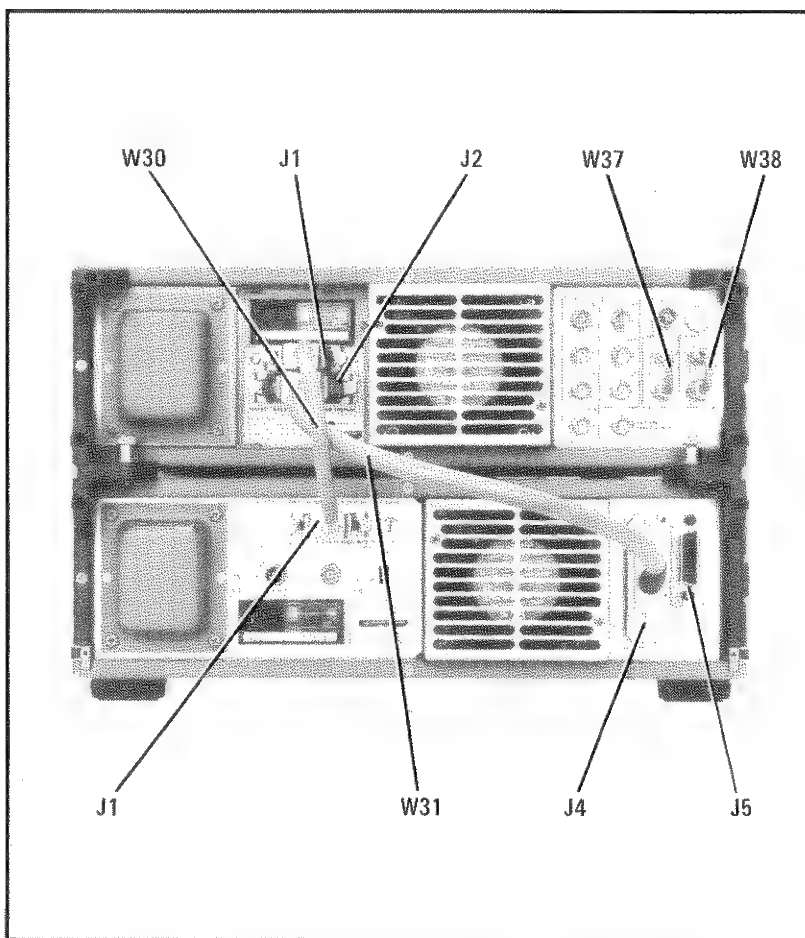


FIGURE 2. REAR PANEL WITH INTERCONNECT CABLES INSTALLED

**CAUTION**

**BEFORE SWITCHING ON THIS INSTRUMENT,** make sure it is adapted to the voltage of the ac power source. Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

Select the line voltage and fuses as follows:

1. Determine the ac line voltage to be used.
2. Position the power line module PC Selector board (on the rear panel of each instrument section) as shown in Figure 3. If the line voltage is not within the instrument requirements, you must use an autotransformer between the ac source and the HP 8568B.
3. Check that the required fuses are installed (in both instrument sections) as follows:  
100/120 – 2 ampere Fast-Blow  
220/240 – 1 ampere Slow-Blow

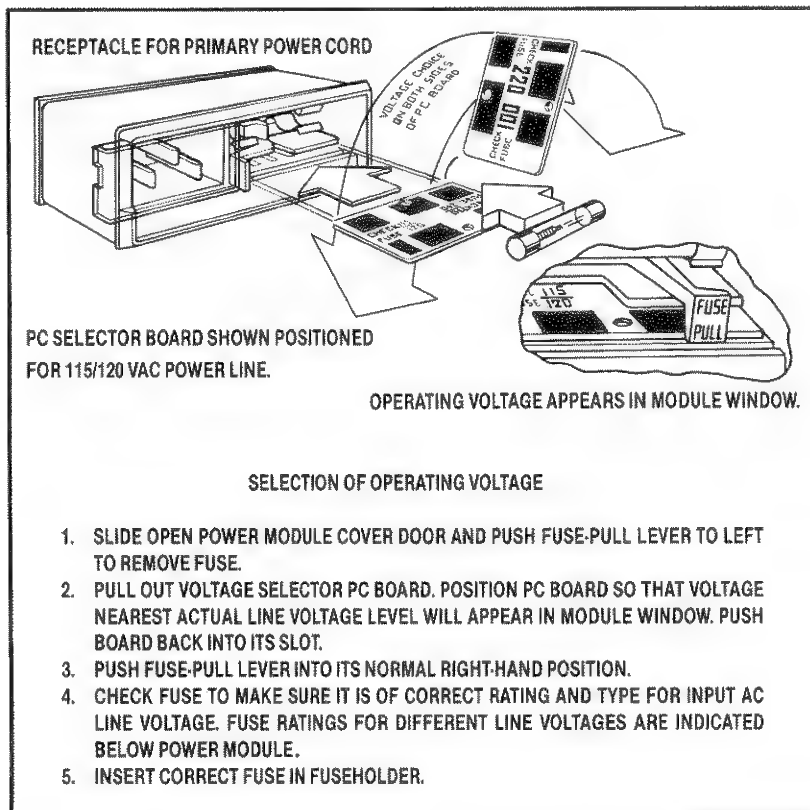


FIGURE 3. VOLTAGE SELECTION WITH POWER MODULE PC BOARD



#### **WARNING**

**Power is still applied to this instrument with the LINE switch in STANDBY. There is no OFF position of the LINE switch. To remove power from the instrument, it is necessary to remove the power cable from the rear of each of the instrument sections.**

### **Power Cables**

In accordance with international safety standards, both sections of this instrument are equipped with three wire AC power cables. If additional cables are needed, contact the nearest HP Office.

#### **WARNING**

**If this instrument is to be energized through an autotransformer, make sure the common terminal of the autotransformer is connected to the protective earth contact of the power source outlet socket.**

### **HP-IB**

The instrument is shipped with the HP-IB address switch preset to 18 (ASCII 2R). If it is necessary to change the HP-IB address, refer to the HP 8568B Operating and Programming Manual for instructions. The HP-IB connector is J5 on the RF Section (see Figure 2).

### **Mating Connectors**

A list of connectors on the front and rear panels of the HP 8568B is given in Table 1. The HP part number, industry identification, and alternate source for the mating connector is given for each connector on the instrument.

TABLE 1. HP 8568B MATING CONNECTORS

	Mating Connector			
	Industry Identification	HP Part Number	C D	Alternate Source
<b>RF Section</b>				
A5J1 CAL OUTPUT	Type BNC, male connector UG-88/U	1250-0256	0	Specialty connector 28 P118-1
A5J3 INPUT 1	Type BNC, male connector UG-88/U	1250-0256	0	Specialty connector 28 P118-1
A5J4 INPUT 2	Type N, male connector UG-21G/U	1250-0882	8	Specialty connector 25 P117-2
J1	Series D, male connector	1251-4955	6	ITT Cannon DBM 5W5D
J2	Type BNC, male connector UG-88/U	1250-0256	0	Specialty connector 28 P118-1
J3	Type BNC, male connector UG-88/U	1250-0256	0	Specialty connector 28 P118-1
J4 (Analyzer Bus)	Series D, male connector 50 contact, 2 rows	1251-4400	6	Amphenol 57-30500-15
J5 (HP-IB)	Series D, male connector 24 contact, 2 rows	10833 A/B/C/D (Cables)		None
<b>IF-Display Section</b>				
J1	Series D, male connector	1251-4955	6	ITT Cannon DBM 5W5D
J2	Series D, male connector	1251-2245	3	TRW DDM-50P
J3-J11	Type BNC, male connector UG-88/U	1250-0256	0	Specialty connector 28 P118-1

## Bench Operation

The instrument has plastic feet and foldaway tilt stands for convenience in bench operation. The plastic feet are shaped to make full width modular instruments self-aligning when stacked. The instrument is shipped with front handles attached for ease of moving.

## Front Handle Removal

To install some instrument options, the front handles need to be removed. See Figure 4 for instructions. When installing an option or replacing the handles be sure that the correct size screw (as indicated in the illustrations) is used to prevent damage to the instrument.

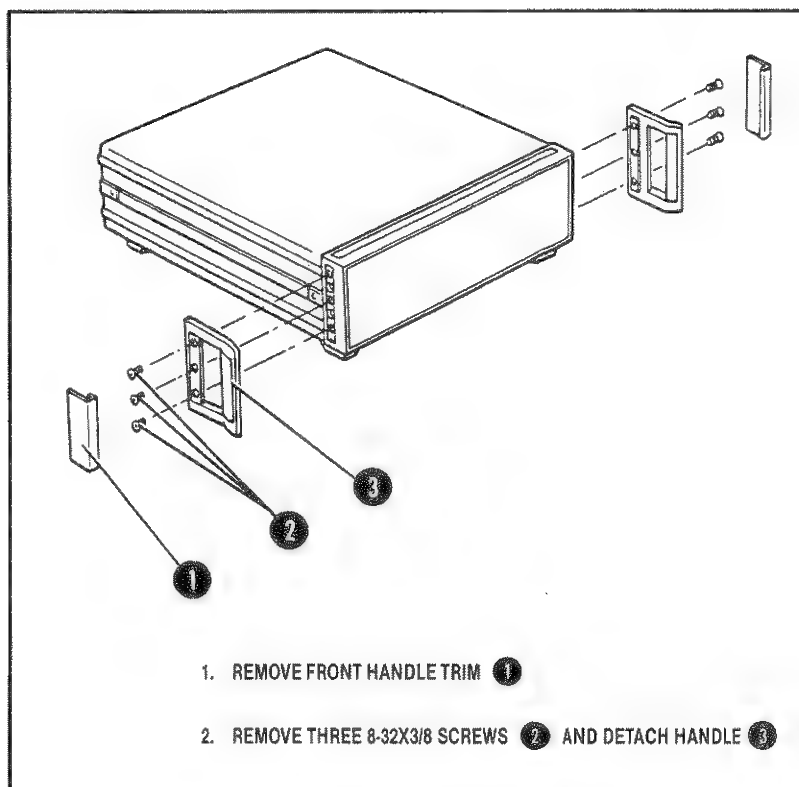


FIGURE 4. REMOVING FRONT HANDLES

## Rack Mounting (Options 908 and 913)

Instrument options 908 and 913 contain the necessary hardware to mount the HP 8568B in a rack of 482.6 mm (19 inches) spacing. Option 908 is for mounting without handles (see Figure 5) and option 913 is for mounting with handles (see Figure 6).

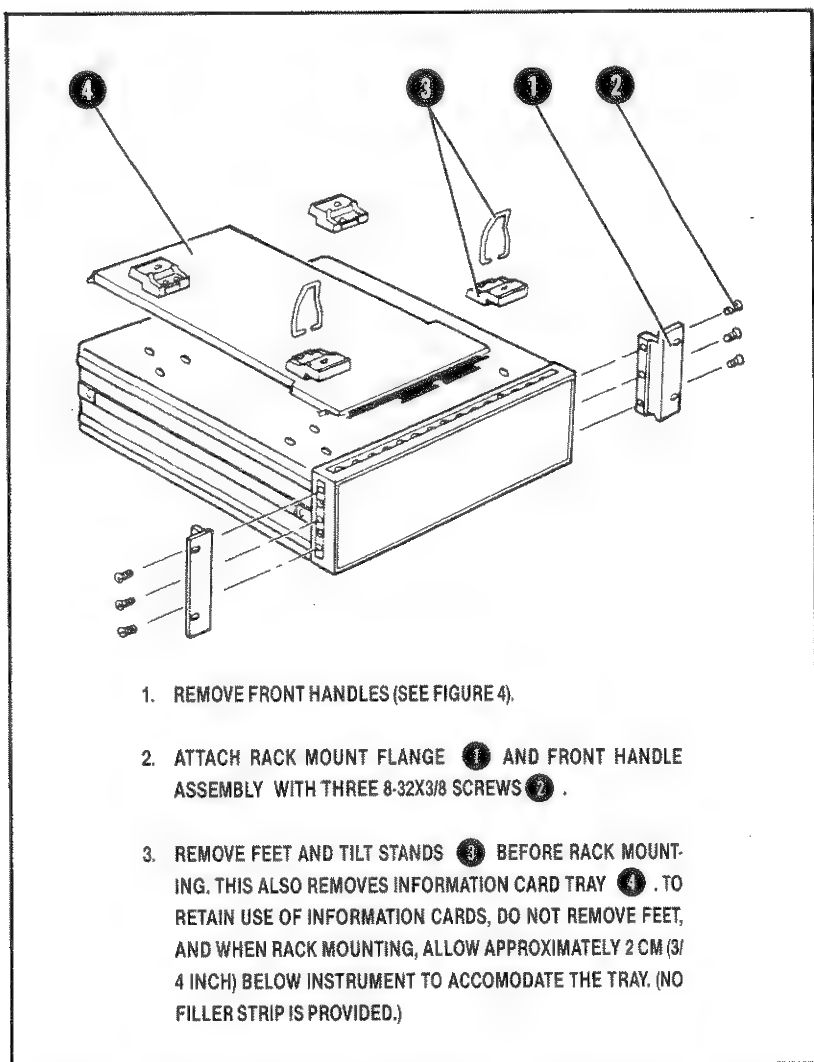


FIGURE 5. OPTION 908 ATTACHING RACK MOUNT FLANGES WITHOUT HANDLES

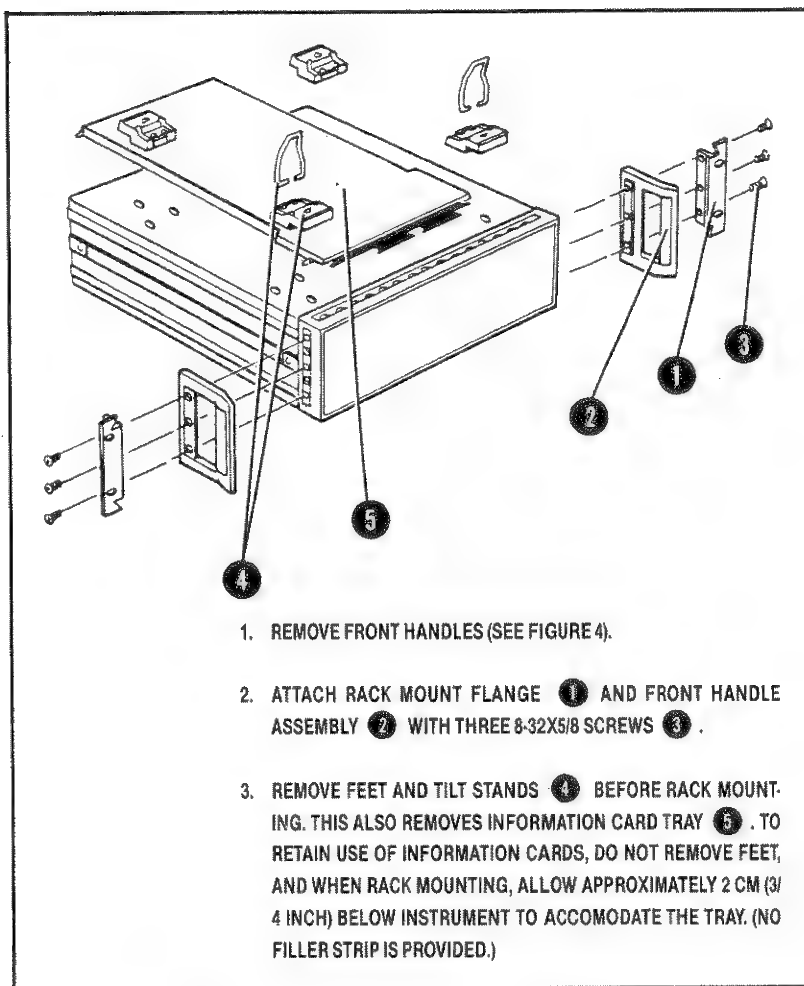


FIGURE 6. OPTION 010 ATTACHING RACK MOUNT FLANGES WITH HANDLES

### Rack Mounting with Slides (Option 010)

Instrument Option 010 contains the necessary hardware to mount the HP 8568B with slides in a rack of 482.6 mm (19 inches) spacing. The kit also contains adapters for mounting in non-HP racks. The slides provide extra support at the sides of the instrument in the rack and, because of the weight of the instrument, are recommended. Refer to Figure 7 and the following instructions to install the slides.

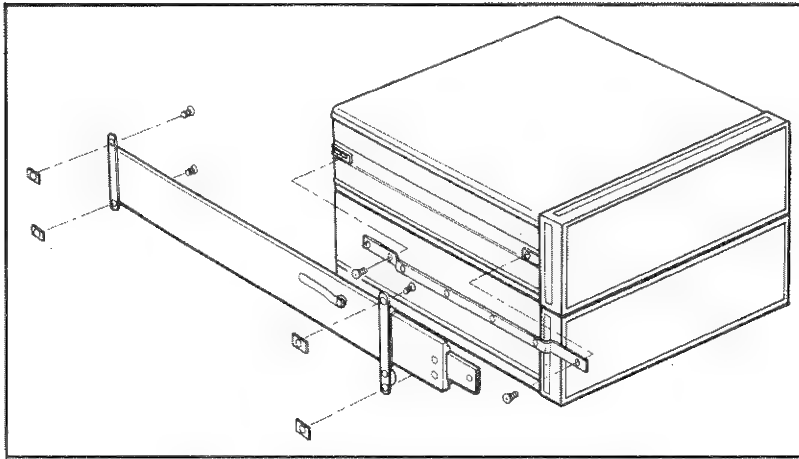


FIGURE 7. OPTION 010 ATTACHING RACK MOUNT SLIDES

1. To gain access to the slide mount holes (in the IF-Display Section), first remove the strap handle on the right side panel. Next, remove the left rear lock foot and slide the left side cover off to rear. Replace it with the panel included in the kit. (If the instrument sections are combined, move the lock foot enough for the side cover to clear, but still support the IF-Display Section.)
2. Remove the front handles on both instrument sections and replace with the 10 1/2 inch handles and/or the 10 1/2 inch rack mount brackets supplied with the kit. (Refer to Figure 4, 5, and 6.)
3. Attach one slide inner member bracket to each side of the instrument using two 10-32 3/8-inch pan head screws per side. Attach the brackets to the inner members of the slides with four 10-32 3/8-inch flat head screws per side.
4. Insert two Unistrut Nuts into each of the four vertical columns of the enclosure and attach the slide outer members with four 10-32 7/16-inch pan head screws per side. Install the instrument by aligning the inner members (attached to instrument) with the outer members (attached to enclosure). If there is any binding, adjust the slides by supporting the instrument and loosening the screws to the Unistrut Nuts at each side of the enclosure. Adjust the slides slightly until they operate freely.

# **QUICK REFERENCE**

## **INTRODUCTION**

The following pages are a compilation of all current HP 8566B/8568B programming codes. More information on each operation can be found in the HP 8566B/8568B Operating and Programming Manual. For comprehensive training in the remote operation of these analyzers, the HP 8566B + 24D/8568B + 24D Spectrum Analyzer Operation Course is offered at selected HP training centers.

### **How to Use This Reference**

This reference is intended for use by the experienced spectrum analyzer programmer.

To find a programming code which performs a particular function, first refer to the functional index which shows the programming codes grouped according to similar function. The key word and brief definition of each code are shown in this index. Once the desired key word is found, refer to the alphabetical listing of the programming codes for further key word definition and syntax information.

For further information on syntax, refer to the Notation Conventions and Syntax Conventions sections. Secondary key words are parameters appearing in capital letters within the argument of key words. Their definitions can be found in the Secondary Key Word Summary.

## Notation Conventions

The following symbols and type styles found in this guide denote the following:

<b>BOLD TYPE</b>	All characters appearing in bold type are key words and must appear exactly as shown.
<b>CAPITAL LETTERS</b>	All characters which are capital letters are secondary key words and appear within the key word syntax. They must appear exactly as shown and their meanings can be found in the Secondary Key Word Summary.
<b>&lt;&gt;</b>	Characters appearing in angular brackets are considered to be elements of the language being defined. Their meanings can be found in the section on syntax conventions unless otherwise specified with the keyword definition.
<b>[ ]</b>	Square brackets indicate that whatever occurs within the brackets is optional
<b> </b>	"or": Indicates a choice of exactly one element from a list (e.g. <b>&lt;a&gt; &lt;b&gt;</b> indicates <b>&lt;a&gt;</b> or <b>&lt;b&gt;</b> but not both).
<b>( )</b>	Parentheses are used to clarify which elements are to be chosen from.
<b>—</b>	Indicates a space must be placed at the indicated location (e.g. <b>A_&lt;a&gt;</b> indicates there must be a space between the key word, <b>A</b> , and the element, <b>&lt;a&gt;</b> ).
<b>:: =</b>	"Is defined as" (e.g. <b>&lt;a&gt;:: = &lt;b&gt;&lt;c&gt;</b> indicates that <b>&lt;a&gt;</b> can be replaced by the series of elements, <b>&lt;b&gt;&lt;c&gt;</b> in any statement where <b>&lt;a&gt;</b> occurs).
<b>{ }</b>	Integers appearing in braces indicate that the integer is transmitted to the analyzer as a single 8-bit byte.
●	Indicates that the programming code applies to the HP 8566B only.
■	Indicates that the programming code applies to the HP 8568B only.



## Syntax Conventions

- <A-block data field>:: =  
    #A<length><command list>; (use when the length of the command list is known)
- <A-block data format>:: =  
    #A<length><command list>
- <analyzer internal I/O bus>:: =  
    ASCII decimal number from 0 to 63
- <analyzer memory address>:: =  
    ASCII decimal number from 0 to 17,700
- <block data field>:: =  
    <A-block data field>|<I-block data field>
- <command list>:: = any spectrum analyzer command
- <CR>:: = {13} (ASCII carriage return)
- <delimiter>:: = <CR>|<LF>|<ETX>|,|;
- <destination>:: =  
    <trace label>|<variable identifier>|TRA|TRB|TRC
- <display memory address>:: =  
    ASCII decimal number from 0 to 4095
- <EOI>:: = end or identify
- <ETX>:: = {3} (ASCII end of text)
- <flow operand 1>:: =  
    <variable identifier>|<numeric data field>
- <flow operand 2>:: =  
    <variable identifier>|numeric data field>
- <function label>:: =  
    2 – 12 ASCII characters defined in the FUNCDEF statement
- <I-block data field>:: =  
    #I<command list>END; (use when the length of the command list is not known)
- <integer>:: = integer number

<key number>:: =  
     integer 1 – 999 defined in KEYDEF statement

<length>:: = two 8-bit bytes specifying the length of the command list

<LF>:: = {10} (ASCII line feed)

<message>:: = ASCII decimal number

<numeric data field>:: = <real>

<numeric data format>:: =  
     <real><CR><LF><EOI>

<operand 1>:: =  
     <trace label>|<variable identifier>|<numeric data field>|TRA|TRB|TRC

<operand 2>:: =  
     <trace label>|<variable identifier>|<numeric data field>|TRA|TRB|TRC

<real>:: = positive or negative real number

<string data field>:: =  
     <string delimiter><command list><string delimiter>

<string delimiter>:: =  
     !|”|\$|%|&|’|/|:|=|@|\|~|`

<terminator>:: =  
     DM|–DM|DB|HZ|KZ|MZ|GZ|MV|UV|SC|MS|US|<delimiter>

<trace destination>:: = <trace label>|TRA|TRB|TRC

<trace label>:: =  
     2 – 12 ASCII characters defined in the TRDEF statement

<trace source>:: = <trace label>|TRA|TRB|TRC

<variable identifier>:: =  
     2 – 12 ASCII characters defined in the VARDEF statement

## FUNCTIONAL INDEX

### FREQUENCY CONTROL

CF	Specifies center frequency
CS	Couples step size
*FA	Specifies start frequency
*FB	Specifies stop frequency
FOFFSET	Specifies frequency offset
FS	Specifies full frequency span as defined by instrument
● KSQL	Unlocks frequency band
KSV	Specifies frequency offset
● KSt	Locks frequency band
■ KS =	Specifies resolution of frequency counter
■ MKFCR	Specifies resolution of frequency counter
SP	Specifies frequency span
SS	Specifies center frequency step size

### INSTRUMENT STATE CONTROL

IP	Sets instrument parameters to preset values
● KST	Performs fast preset 2 – 22 GHz
● KSL	Performs external mixer preset
KS(	Locks save registers
KS)	Unlocks save registers
● LF	Presets 0 – 2.5 GHz
RC	Recalls previously saved state
RCLS	Recalls previously saved state
SAVES	Saves current state of the analyzer in the specified register
SV	Saves current state of analyzer in specified register
USTATE	Configures or returns configuration of user-defined states: ONEOS, ONSWP, TRMATH, VARDEF, FUNCDEF, TRDEF

### AMPLITUDE CONTROL

AT	Specifies input attenuation
AUNITS	Specifies amplitude units for input, output and display
*CA	Couples input attenuation
E4	Moves active marker to reference level
*KSA	Selects dBm as amplitude units
KSB	Selects dBmV as amplitude units
KSC	Selects dBuV as amplitude units
KSD	Selects voltage as amplitude units
KSI	Extends reference level range
KSW	Performs amplitude error correction routine
KSX	Incorporates correction data in amplitude readouts

\*Selected with instrument preset (IP)

<b>KSY</b>	Does not incorporate correction data in amplitude readouts
<b>KSZ</b>	Specifies reference level offset
<b>KSq</b>	Decouples IF gain and input attenuation
<b>KSw</b>	Displays correction data
<b>KS,</b>	Sets mixer level
<b>LG</b>	Selects log scale
<b>LN</b>	Selects linear scale
<b>MKRL</b>	Moves active marker to reference level
<b>ML</b>	Specifies mixer level
<b>RL</b>	Specifies reference level
<b>ROFFSET</b>	Specifies reference level offset

## BANDWIDTH CONTROL

<b>*CR</b>	Couples resolution bandwidth
<b>*CV</b>	Couples video bandwidth
<b>RB</b>	Specifies resolution bandwidth
<b>VB</b>	Specifies video bandwidth
<b>VBO</b>	Specifies coupling ratio of video bandwidth and resolution bandwidth

## SWEEP AND TRIGGER CONTROL

<b>*CONTS</b>	Selects continuous sweep mode
<b>*CT</b>	Couples sweep time
<b>■ KSF</b>	Measures sweep time
<b>KSt</b>	Continues sweep from marker
<b>KSu</b>	Stops sweep at active marker
<b>KSx</b>	Sets external trigger (eliminates auto-refresh)
<b>KSy</b>	Sets video trigger (eliminates auto-refresh)
<b>ST</b>	Specifies sweep time
<b>SNGLS</b>	Selects single sweep mode
<b>*S1</b>	Selects continuous sweep mode
<b>S2</b>	Selects single sweep mode
<b>TM</b>	Selects trigger mode: free run, video, line, external
<b>TS</b>	Takes a sweep
<b>*T1</b>	Sets trigger mode to free run
<b>T2</b>	Sets trigger mode to line
<b>T3</b>	Sets trigger mode to external
<b>T4</b>	Sets trigger mode to video

## MARKER CONTROL

<b>E1</b>	Moves active marker to maximum signal detected
<b>E2</b>	Moves marker frequency into center frequency
<b>E3</b>	Moves marker or delta frequency into step size
<b>E4</b>	Moves active marker to reference level
<b>● KSK</b>	Moves active marker to next highest peak

\*Selected with instrument preset (IP)

<b>KSL</b>	Turns off average noise level marker
<b>KSM</b>	Returns average value at marker, normalized to 1 Hz band-width
● <b>KSN</b>	Moves active marker to minimum value detected
<b>KSO</b>	Moves marker delta frequency into span
■ <b>KSt</b>	Continues sweep from marker
<b>KSu</b>	Stops sweep at active marker
■ <b>KS=</b>	Specifies resolution of marker frequency counter
<b>KS{92}</b>	Enters DL, TH, M2, M3 in display units
<b>MA</b>	Returns marker amplitude
■ <b>*MCO</b>	Turns off marker frequency count
■ <b>MCI</b>	Turns on marker frequency count
<b>MF</b>	Returns marker frequency
<b>MKA</b>	Specifies amplitude of active marker
<b>MKACT</b>	Specifies active marker: 1, 2, 3, or 4
<b>MKCF</b>	Enters marker frequency into center frequency
<b>MKCONT</b>	Continues sweep from marker
<b>MKD</b>	Moves delta marker to specified frequency
<b>MKF</b>	Specifies frequency of active marker
■ <b>MKFC</b>	Counts marker frequency for greater resolution (See MKFCR)
■ <b>MKFCR</b>	Specifies resolution of marker frequency counter
<b>MKMIN</b>	Moves active marker to minimum signal detected
<b>MKN</b>	Moves active marker to specified frequency or center screen
<b>MKNOISE</b>	Returns average value at marker, normalized to 1 Hz band-width
<b>MKOFF</b>	Turns all markers, or the active marker off
<b>MKP</b>	Specifies marker position horizontally, in display units
<b>MKPAUSE</b>	Pauses sweep at marker for duration of specified delay time (in seconds)
<b>MKPK</b>	Moves active marker to maximum signal detected, or to adjacent signal peaks
<b>*MKPX</b>	Specifies minimum excursion for peak identification. Preset value is 6 dB
<b>MKREAD</b>	Specifies marker readout mode
<b>MKRL</b>	Moves active marker to reference level
<b>MKSP</b>	Moves marker delta frequency into span
<b>MKSS</b>	Moves marker frequency to center frequency step size
<b>MKSTOP</b>	Stops sweep at active marker
<b>MKTRACE</b>	Moves active marker to corresponding position on another specified trace
<b>MKTRACK</b>	Turns marker signal track on or off
<b>MKTYPE</b>	Sets marker type
<b>*MT0</b>	Turns off marker signal track
<b>MT1</b>	Turns on marker signal track
<b>*M1</b>	Turns off active marker
<b>M2</b>	Turns on active marker and moves it to center screen
<b>M3</b>	Turns on delta marker
<b>M4</b>	Turns on marker zoom

\*Selected with instrument preset (IP)

## COUPLING CONTROL

*CA	Couples input attenuation
*CR	Couples resolution bandwidth
*CS	Couples step size
*CT	Couples sweep time
*CV	Couples video bandwidth
*VBO	Specifies coupling ratio of video bandwidth and resolution bandwidth

## PRESELECTOR CONTROL

● FPKA	Performs fast preselector peak and returns measured value of active marker
● KSJ	Allows manual control of DAC
● KS#	Turns off YTX self-heating correction
● KS/	Allows manual peaking of preselector
● KS=	Selects factory preselector setting
● PP	Peaks preselector

## RF INPUT CONTROL

■ I1	Enables left RF input
■ *I2	Enables right RF input

## EXTERNAL MIXING COMMANDS

● KSU	Performs external mixer preset
● KSv	Identifies signals for external mixing frequency bands

Additional external mixing commands can be found on page 41.

## DISPLAY CONTROL

*ANNOT	Turns annotation on or off. Preset condition is on.
AUNITS	Specifies amplitude units for input, output, and display
DL	Specifies display line level in dBm
DLE	Turns display line on and off
*GRAT	Turns graticule on or off. Preset condition is on.
KSg	Turns off CRT beam
*KSh	Turns on CRT beam
KSm	Turns off graticule
*KSn	Turns on graticule
KSo	Turns off annotation
*KSp	Turns on annotation
*LG	Selects log scale
LN	Selects linear scale
*LO	Turns off display line
TH	Specifies display threshold value
THE	Turns threshold on or off
*TO	Turns off threshold
TRGRPH	Dimensions and graphs a trace

\*Selected with instrument preset (IP)

## READING AND WRITING DISPLAY MEMORY

<b>*DA</b>	Specifies display address
<b>DD</b>	Writes to display
<b>DR</b>	Reads display and increments address
<b>DSPLY</b>	Displays the value of a variable on the analyzer screen
<b>DT</b>	Defines a character for label termination
<b>DW</b>	Writes to display and increments address
<b>*D1</b>	Sets display to normal size
<b>D2</b>	Sets display to full CRT size
<b>D3</b>	Sets display to expanded size
<b>*EM</b>	Erases trace C memory
<b>GR</b>	Graphs specified y values on CRT
<b>*HD</b>	Holds or disables data entry and blanks active function CRT readout
<b>IB</b>	Inputs trace B in binary units
<b>KSE</b>	Sets title mode
<b>KS{39}</b>	Writes to display memory in fast binary
<b>KS{125}</b>	Writes to display memory in binary
<b>KS{127}</b>	Prepares analyzer to accept binary display write commands
<b>LB</b>	Writes specified characters on CRT
<b>OP</b>	Returns lower left and upper right vertices of display window
<b>PA</b>	Draws vectors to specified x and y positions
<b>*PD</b>	Turns on beam to view vector
<b>PR</b>	Draws vector from last absolute position
<b>PS</b>	Skips to next display page
<b>PU</b>	Turns off beam, blanking vector
<b>SW</b>	Skips to next control instruction
<b>TEXT</b>	Writes text string to screen at current pen location

## TRACE PROCESSING

<b>*A1</b>	Clear-writes trace A
<b>A2</b>	Max holds trace A
<b>A3</b>	Stores and views trace A
<b>A4</b>	Stores and blanks trace A
<b>B1</b>	Clear-writes trace B
<b>B2</b>	Max holds trace B
<b>B3</b>	Stores and views trace B
<b>*B4</b>	Stores and blanks trace B
<b>BLANK</b>	Stores and blanks specified trace register
<b>CLRW</b>	Clear-writes specified trace register
<b>KSj</b>	Stores and views trace C
<b>KSk</b>	Stores and blanks trace C
<b>KS{39}</b>	Writes to display memory in fast binary
<b>KS{123}</b>	Reads display in binary units

\*Selected with instrument preset (IP)

<b>KS{125}</b>	Writes to display memory in binary units
<b>KS{126}</b>	Outputs every nth value of trace
<b>MOV</b>	Moves source to the destination
<b>MXMH</b>	Max holds the specified trace register
<b>TA</b>	Outputs trace A
<b>TB</b>	Outputs trace B
<b>TRDSP</b>	Turns specified trace on or off, but continues taking information
<b>VIEW</b>	Views specified trace register

## TRACE MATH

<b>AMB</b>	A – B into A
<b>AMBPL</b>	(A – B) + DL into A
<b>APB</b>	A + B into A
<b>AXB</b>	Exchanges A and B
<b>BL</b>	B – DL into B
<b>BML</b>	B – DL into B
<b>BTC</b>	B into C
<b>BXC</b>	Exchanges B and C
<b>*C1</b>	A – B off
<b>C2</b>	A – B into A
<b>EX</b>	Exchanges A and B
<b>KSG</b>	Turns on video averaging
<b>*KSH</b>	Turns off video averaging
<b>KSc</b>	A + B into A
<b>KSi</b>	Exchanges B and C
<b>KSI</b>	B into C
<b>TRMATH</b>	Executes trace math or user-operator commands at end of sweep
<b>VAVG</b>	Turns video averaging on or off

## OTHER TRACE FUNCTIONS

<b>AUNITS</b>	Specifies amplitude units for input, output, and display
<b>COMPRESS</b>	Compresses trace source to fit trace destination
<b>CONCAT</b>	Concatenates operands and sends new trace to destination
<b>DET</b>	Specifies input detector type
<b>FFT</b>	Performs a forward fast fourier transform
<b>*KSa</b>	Selects normal detection
<b>KSb</b>	Selects position peak detection
<b>KSd</b>	Selects negative peak detection
<b>KSe</b>	Selects sample detection
<b>MEAN</b>	Returns trace mean
<b>ONEOS</b>	Executes specified command(s) at end of sweep
<b>ONSWP</b>	Executes specified command(s) at start of sweep
<b>PDA</b>	Returns probability density of amplitude
<b>PDF</b>	Returns probability density of frequency
<b>PEAKS</b>	Returns number of peak signals

\*Selected with instrument preset (IP)



<b>PWRBW</b>	Returns bandwidth of specified percent of total power
<b>RMS</b>	Returns RMS value of trace in display units
<b>SMOOTH</b>	Smooths trace over specified number of points
<b>STDEV</b>	Returns standard deviation of trace amplitude in display units
<b>SUM</b>	Returns sum of trace element amplitudes in display units
<b>SUMSQ</b>	Squares trace element amplitudes and returns their sum
<b>TRDEF</b>	Defines user-defined trace
<b>TRGRPH</b>	Dimensions and graphs a trace
<b>TRPRST</b>	Sets trace operations to preset values
<b>TRSTAT</b>	Returns current trace operations
<b>TWNDOW</b>	Formats trace information for fast fourier analysis (FFT)
<b>VARIANCE</b>	Returns amplitude variance of trace

## USER-DEFINED COMMANDS

<b>*DISPOSE</b>	Frees memory previously allocated by user defined functions. Instrument preset disposes ONEOS, ONSWP, and TRMATH functions.
<b>FUNCDEF</b>	Assigns specified program to function label
<b>KEYDEF</b>	Assigns function label to softkey number (See FUNCDEF)
<b>KEYEXC</b>	Executes specified softkey
<b>MEM</b>	Returns amount of allocatable memory available for user-defined commands
<b>ONEOS</b>	Executes specified command(s) at end of sweep
<b>ONSWP</b>	Executes specified command(s) at start of sweep
<b>TRDEF</b>	Defines user-defined trace
<b>TRMATH</b>	Executes specified trace math or user-operator commands at end of sweep
<b>USTATE</b>	Configures or returns configuration of user-defined state: ONEOS, ONSWP, TRMATH, VARDEF, FUNCDEF, TRDEF
<b>*VARDEF</b>	Defines variable name and assigns real value to it. Preset reassigns initial value to variable identifier.

## PROGRAM FLOW CONTROL

<b>IF</b>	Compares two specified operands. If condition is true, executes commands until next ELSE or ENDIF statements are countered
<b>THEN</b>	No-operation function
<b>ELSE</b>	Delimits alternate condition of IF command
<b>ENDIF</b>	Delimits end of IF command
<b>REPEAT</b>	Delimits the top of the REPEAT UNTIL looping construct
<b>UNTIL</b>	Compares two specified operands. If condition is true, commands are executed following this command. If condition is false operands are executed following the previous REPEAT command.

\*Selected with instrument preset (IP)

## MATH FUNCTIONS

<b>ADD</b>	Operand 1 + operand 2 into destination
<b>AVG</b>	Operand is averaged into destination
<b>CONCAT</b>	Concatenates two operands and sends new trace to destination
<b>CTA</b>	Converts operand values from display units to measurement units
<b>CTM</b>	Converts operand values from measurement units to display units
<b>DIV</b>	Operand 1 / operand 2 into destination
<b>EXP</b>	Operand is divided by specified scaling factor before being raised as a power of 10
<b>LOG</b>	LOG of operand is taken and multiplied by specified scaling factor
<b>MIN</b>	Minimum between operands is stored in destination
<b>MOV</b>	Source is moved to destination
<b>MPY</b>	Operand 1 * operand 2 into destination
<b>MXM</b>	Maximum between operands is stored in destination
<b>SQR</b>	Square root of operand is stored in destination
<b>SUB</b>	Operand 1 – operand 2 into destination
<b>XCH</b>	Contents of the two destinations are exchanged

Operations on specific traces (A, B, and C) can be found in the Trace Math section.

## INFORMATION AND SERVICE DIAGNOSTICS COMMANDS

<b>BRD</b>	Reads data word at analyzer's internal input/output bus
<b>BWR</b>	Writes data word to analyzer's internal input/output bus
<b>ERR</b>	Returns results of processor test
<b>ID</b>	Returns the HP model number of analyzer used (HP 8566B or HP 8568B)
● <b>KSF</b>	Shifts YTO by intermediate frequency
■ <b>KSF</b>	Measures sweep time
■ <b>KSJ</b>	Allows manual control of DAC
■ <b>KSK</b>	Counts pilot IF at marker
■ <b>KSN</b>	Counts voltage-controlled oscillator at marker
● <b>KSQ</b>	Unlocks frequency band
■ <b>KSQ</b>	Counts signal IF
■ <b>KSR</b>	Turns frequency diagnostics on
■ <b>*KSS</b>	Second LO frequency is determined automatically
■ <b>KST</b>	Shifts second LO down
■ <b>KSU</b>	Shifts second LO up
■ <b>KSf</b>	Recovers last instrument state at power on
■ <b>KSq</b>	De-couples IF gain and input attenuation
■ <b>KSr</b>	Sets service request 102

\*Selected with instrument preset (IP)

● KSt	Locks frequency band
■ KSt	Continues sweep from marker
KSu	Stops sweep at active marker
■ KSw	Inhibits phase lock
KSw	Displays correction data
■ KS =	Specifies resolution of frequency counter
● KS =	Selects factory preselector setting
■ KS>	Specifies preamp gain for signal input 1
■ KS<	Specifies preamp gain for signal input 2
● KS#	Turns off YTX self-heating correction
● KS/	Selects manual preselector peak
MBRD	Reads specified number of bytes starting at specified address and returns to controller
MBWR	Writes specified block data field into analyzer's memory starting at specified address
MRD	Reads two-byte word starting at specified analyzer memory address and returns word to controller
MRDB	Reads 8-bit byte contained in specified address and returns byte to controller
MWR	Writes two-byte word to specified analyzer memory address
MWRB	Writes one-byte message to specified analyzer memory address
REV	Returns analyzer revision number
RQS	Returns decimal weighting of status byte bits which are enabled during service request

## OUTPUT FORMAT CONTROL

DR	Reads display and increments address
DSPLY	Displays value of variable on analyzer screen
EE	Enables front panel number entry
KSJ	Allows manual control of DAC
KSP	Sets HP-IB address
● KSS	Sets fast HP-IB
KS{91}	Returns amplitude error
● KS{94}	Returns code for harmonic number in binary
KS{123}	Reads display in binary units
KS{126}	Returns every nth value of trace
LL	Provides lower left x-y recorder output voltage at rear panel
MA	Returns marker amplitude
*MDS	Specifies measurement data size to byte or word. Preset condition is word.
MDU	Returns values of CRT baseline and reference level
MF	Returns marker frequency
OA	Returns active function
OL	Returns learn string
OT	Returns display annotation

\*Selected with instrument preset (IP)

- O1**           Selects output format as integers (ASCII) representing display units or display memory instruction words
- O2**           Selects output format as two 8-bit bytes
- \*O3**          Selects output format as real numbers (ASCII) in Hz, volts, dBm, or seconds
- O4**           Selects output format as one 8-bit byte
- TA**          Outputs trace A
- TB**          Outputs trace B
- \*TDF**        Selects trace data output format as O1, O2, O3, O4, A-block data field, or I-block data field. Preset format is O3.
- UR**          Provides upper right x-y recorder output voltage at rear panel

## SYNCHRONIZATION

- DONE**       Sends message to controller after preceding commands are executed
- TS**         Takes a sweep

## SERVICE REQUEST

- KSr**         Allows service request 102
- KS{43}**    Allows service request 140 and 102
- RQS**        Returns decimal weighting of status byte bits which are enabled during service request
- R1**         Resets service request 140
- R2**         Allows service request 140 and 104
- \*R3**         Allows service request 140 and 110
- R4**         Allows service request 140 and 102
- SRQ**        Sets service request if operand bits are allowed by RQS

SRQ	COMMAND	BIT	DEFINITION
102	R4	1	units key pressed
102	●KS{43}	1	frequency limit exceeded
104	R2	2	end of sweep
110	R3	3	hardware broken
120	RQS	4	command complete – input buffer empty
140	all	5	illegal command
1xx	–	6	universal HP-IB service

\*Selected with instrument preset (IP)

## PLOTTER OUTPUT

LL	Provides lower left x-y recorder output voltage at rear panel
PLOT	Plots CRT. Scaling points, P1 and P2 must be specified and must be compatible with plotter.
P1x	Represents first x-axis scaling point to be specified in PLOT command
P1y	Represents first y-axis scaling point to be specified in PLOT command
P2x	Represents second x-axis scaling point to be specified in PLOT command
P2y	Represents second y-axis scaling point to be specified in PLOT command
UR	Provides upper right x-y recorder output voltage at rear panel

## MEMORY INFORMATION

*EM	Erases trace C memory
KSz	Sets display storage address
KS	Writes to display storage
MEM	Returns amount of allocatable memory available for user-defined commands, in bytes

## TRACKING GENERATOR APPLICATION

■ *KSS	Second LO frequency is determined automatically
■ KST	Shifts second LO down (necessary for HP 8444A-059 operation in spans <1 MHz)
■ KSU	Shifts second LO up

## OPERATOR ENTRY

EE	Enables front panel data number entry
EK	Enables DATA knob
EP	Enables manual entry into specified command
*HD	Holds or disables data entry and blanks active function CRT readout
KS	Shifts front panel keys

\*Selected with instrument preset (IP)

## Programming Codes

### A

**ADD\_**<destination>,<operand 1>,<operand 2>;  
Adds the operands and sends the sum to the destination.

**AMB\_ON/OFF**;  
Subtracts trace B from trace A and sends the result to trace A.

**AMBPL**;  
Subtracts trace B from trace A, adds the display line value to the difference, and sends the result to trace A.

**ANNOT\_ON/OFF**?  
Turns the display annotation on or off. IP turns on the annotation.  
Query response: ON/OFF

**APB**;  
Adds trace A and trace B and sends the result to trace A.

**AT**[\_(<real>[DB])|UP|DN|EP|?];  
Specifies the RF input attenuation. Default units are DB.  
Query response: <numeric data format>

**AUNITS\_V**|DBM|DBMV|DBUV|?;  
Specifies the amplitude units for input, output and display.

**AVG\_**<destination>,<operand 1>,<average count>;  
Computes the average value of the operand and the destination according to the following algorithm:  
$$((N - 1) \times \text{<destination>} + \text{<operand 1>}) / N$$
  
where N is the specified average count  
<average count>:: = integer which selects the counter value

**AXB**;  
Exchanges trace A and trace B.

**A1**;  
Clear-writes trace A. Selected with IP.

**A2**;  
Updates each element of trace A with the maximum level detected.

**A3**;  
Stores and views trace A.

**A4**;  
Stores and blanks trace A.

## **B**

### **BL;**

Subtracts the display line from trace B and sends the result to trace B.

### **BLANK\_(TRA|TRB|TRC);**

Stores and blanks the specified trace register.

### **BML;**

Subtracts the display line from trace B and sends the result to trace B.

### **BRD\_<analyzer memory address>;**

Reads the two-byte word at the analyzer's internal input/output bus, at the specified address.

### **BTC;**

Transfers trace B to trace C.

### **BWR\_<analyzer internal I/O bus>,<message>;**

Writes a two-byte word to the analyzer's internal input/output bus, at the specified address.

<message>:: = ASCII decimal number representing a two-byte word

### **BXC;**

Exchanges trace B and trace C.

### **B1;**

Clear-writes trace B.

### **B2;**

Updates each element of trace B with the maximum level detected.

### **B3;**

Stores and views trace B.

### **B4;**

Stores and blanks trace B. Selected with IP.

## **C**

### **CA;**

Couples the RF input attenuator. Selected with IP.

### **CF\_(<real>[HZ|KZ|MZ|GZ])|UP|DN|EP|?];**

Specifies the center frequency. Default units are Hz.

Query response: <numeric data format>

### **CLRAVG;**

Sets the average counter to 1.

**CLRW\_(TRA|TRB);**

Clear-writes the specified trace register.

**COMPRESS\_<destination>,<source>,(AVG|POS|NEG|NRM|PK-PIT|PK-AVG|SMP)**

Compresses the trace source to fit the trace destination according to the specified compression algorithm.

<destination>:: = <trace label>

<source>:: = <trace label>

**CONCAT\_<trace destination>,<trace operand>,<trace operand>;**

Concatenates the trace operands and sends the new trace array to the destination.

<trace operand>:: = <trace label>|TRA|TRB|TRC

**CONTS;**

Selects continuous sweep mode. Selected with IP.

**CR;**

Couples the resolution bandwidth. Selected with IP.

**CS;**

Couples the center frequency step size. Selected with IP.

**CT;**

Couples the sweep time. Selected with IP.

**CTA\_<destination>,<operand>;**

Converts the operand values from display units to dBm.

<destination>:: = <variable identifier>

<operand>:: = <variable identifier>

**CTM\_<destination>,<operand>;**

Converts the operand values from dBm units to display units.

<destination>:: = <variable identifier>

<operand>:: = <variable identifier>

**CV;**

Couples the video bandwidth. Selected with IP.

**C1;**

Turns off the A – B into A function. Selected with IP.

**C2;**

Subtracts trace B from trace A and sends the result to trace A.



## D

**DA**<display memory address>;

Specifies the analyzer display memory address.

**[DA**<display memory address>;**]DD**<binary value><binary value>

Writes the specified 8-bit-binary bytes into the specified analyzer display memory address.

<binary value>::8-bit binary number

**DET\_POS**|**NEG**|**NRM**|**SMP**?;

Selects the specified analyzer input detection.

Query response: **POS**|**NEG**|**NRM**|**SMP**

**DISPOSE\_**<operand>;

Frees memory previously allocated by the specified operand. **DISPOSE ALL** clears all operands. **IP** disposes **ONEOS**, **ONSWP**, and **TRMATH** functions.

<operand>:: = <variable identifier>|<trace label>|<function label>|

**ONEOS**|**ONSWP**|**TRMATH**|<key number>|**ALL**

**DIV\_**<destination>,<operand 1>,<operand 2>;

Divides operand 1 by operand 2 and sends the result to the destination.

**DL\_**(<real>[**DM**|**MV**|**UV**])|**UP**|**DN**|**EP**?];

Specifies a display line level that is displayed on the CRT. Default units are dBm.

Query response: <numeric data format>

**DLE\_ON**|**OFF**?;

Turns the display line on or off.

Query response: **ON**|**OFF**

**[TS;]**<command list>;**DONE**;

This command is a synchronizing function that sends a 1 to the controller after the command list has been executed. If a **TS** (take sweep) precedes the command list, execution of the command list begins after the sweep is completed.

**[O1|O2|O3|O4;]**[**DA**<display memory address>;**]DR**;

Returns the contents of the specified analyzer display memory address.

The contents are formatted and each **DR** increments the display address by 1.

**DSPLY\_**<variable identifier>,<field width>.<decimal places>;

Displays the current value of a variable on the analyzer screen.

<field width>:: = integer specifying the total number of characters displayed

<decimal places>:: = integer specifying the number of digits to the right of the decimal point

**DT**<character>;

Establishes a character for label termination or for title (KSE) entry termination.

<character>:: = any ASCII character

**[DA**<display memory address>;**DW**[<real><terminator>]

Writes the value in the entry to the specified display memory address and increments the address by 1. This operation can also be done via the front panel using KS|.

**D1;**

Sets the display to normal size. Selected with IP.

**D2;**

Sets the display to full CRT size.

**D3;**

Sets the display to expanded size.

## **E**

**EE;**

Allows the operator to make an entry to the DATA buffer with the DATA number/units front panel keyboard.

**EK;**

Allows the operator to change the active function value with the front panel DATA knob.

**IF\_**<flow operand 1>,(GT|LT|EQ|NE|GE|LE),<flow operand 2>**[THEN]**  
<command list>**[ELSE**<command list>**]ENDIF;**

Compares flow operand 1 to flow operand 2. If the condition is true, the command list is executed. Otherwise, commands following the next ELSE or ENDIF statements are executed.

**EM;**

Replaces trace C memory (3073-4095) with an end of memory word, 1044, and resets the display address to 3072. Selected with IP.

**IF\_**<flow operand 1>,(GT|LT|EQ|NE|GE|LE),<flow operand 2>**[THEN-**  
<command list>**[ELSE**<command list>**]ENDIF;**

Compares flow operand 1 to flow operand 2. If the condition is true, the command list is executed. Otherwise, commands following the next ELSE or ENDIF statements are executed.

**ERR?;**

Queries the results of the processor test (which is performed during instrument turn-on) and returns a list of integer numbers to the controller.

**EX;**

Exchanges trace A and trace B.

**EXP\_**<destination>,<operand 1>,<scaling factor>;

The operand is divided by the specified scaling factor before being raised as a power of 10.

<scaling factor>:: = <variable identifier>|<numeric data field>

**E1;**

Moves the active marker to the maximum signal detected.

**E2;**

Moves the active marker frequency into the center frequency.

**E3;**

Moves the active marker frequency or the delta marker frequency into the center frequency step size.

**E4;**

Moves the active marker to the reference level.

## F

**FA\_**(<real>[HZ|KZ|MZ|GZ])|UP|DN|EP|?);

Specifies the start frequency. Default units are Hz. Selected with IP.

Query response: <numeric data format>

**FB\_**(<real>[HZ|KZ|MZ|GZ])|UP|DN|EP|?);

Specifies the stop frequency. Default units are Hz. Selected with IP.

Query response: <numeric data format>

**FFT\_**<trace destination>,<trace source>,<window>;

Performs a forward fast fourier transform on the source trace and sends the results to the destination trace. Before executing FFT, a trace window must be defined with the TWNDOW command, for proper formatting. (See TWNDOW.)

<window>:: = <trace label>

**FOFFSET\_**(<real>[HZ|KZ|MZ|GZ])|EP|?);

Specifies the frequency offset for all absolute frequency readouts such as center frequency. Default units are Hz.

Query response: <numeric data format>

● **FPKA;**

Performs a fast preselector peak and returns the measured value at the active marker.

**FS;**

Selects the full frequency span as defined by the instrument.

**FUNCDEF\_**<function label>,<string data field>|<block data field>|?);

Assigns the specified program to the function label. After FUNCDEF is executed, the program is executed whenever the function label is encountered.

Query response: <A-block data format>

## G

**[D1|D2|D3];**[DA<display memory address>];GR<y-value>;

Graphs successive y-values as amplitudes on the CRT, incrementing horizontal positions by 1 from left to right for each y-value specified. Trace starts at x=0 position.

<y-value>::=<integer><delimiter>[y-value]

**GRAT\_ON|OFF|?**;

Turns the graticule on or off. IP turns on the graticule.

Query response: ON|OFF

## H

**HD;**

Holds or disables data entry and blanks the active function CRT readout. Selected with IP.

## I

**IB<entry>;**

Sends the specified entry into trace B beginning at display address 1025.

<entry>::= exactly 2002, 8-bit binary bytes

**ID;**

Returns the HP model number of the analyzer being used (HP 8566B or HP 8568B)

**IF\_<flow operand 1>,(GT|LT|EQ|NE|GE|LE),<flow operand 2>[THEN]**  
**<command list>[ELSE]<command list>ENDIF;**

Compares flow operand 1 to flow operand 2. If the condition is true, the command list is executed. Otherwise, commands following the next ELSE or ENDIF statements are executed.

**IP;**

Sets instrument parameters to their preset values.

**■I1;**

Enables the left RF input.

**■I2;**

Enables the right RF input. Selected with IP.

## K

**KEYDEF\_<key number>,<function label>|?);**

Assigns the previously defined function label (see FUNCDEF) to the specified softkey number. Once this command is executed, the command list assigned to the function label can be executed by pressing SHIFT, the key number, and the Hz on the front panel.

Query response: <A-block data format>

**KEYEXC\_<key number>;**

Executes the previously assigned softkey number. (See KEYDEF.)

**KS;**

Shifts the front panel key functions.

**KSA;**

Selects dBm as amplitude units. Selected with IP.

**KSB;**

Selects dBmV as amplitude units.

**KSC;**

Selects dB $\mu$ V as amplitude units.

**KSD;**

Selects voltage as amplitude units.

**KSE;**

Sets the analyzer to title mode where characters called from the analyzer character set are displayed on the top line of the CRT. Up to 64 characters can be displayed.

● **KSF;**

Shifts the YTO by the intermediate frequency.

■ **KSF;**

Measures the sweep time.

**KSG[<average length>];**

Turns on the video averaging.

<average length>; = real number representing the maximum number of sweeps executed for averaging. Default length is 100.

**KSH;**

Turns off the video averaging. Selected with IP.

**KSI;**

Allows the reference level to be extended up to + 60 dBm.

● **KSJ\_<real><delimiter>**

Allows manual control of the DACs. All delimiters set the following DACs to the same specified value:

- PLL 2 pre-tune
- span attenuator
- scan time
- auxilliary offset
- YTX DAC
- YTX pre-tune DAC

■ **KSJ\_<real>(HZ|KZ|MZ|GZ|UP|DN|<CR>|<LF>|<ETX>|;|,)**

Allows manual control of the DACs.

The terminators specify which DAC is to be set to the specified value:

- HZ sets value of L.S. YTO DAC
- KZ sets value of M.S. YTO DAC
- MZ sets value of YTO DAC
- GZ sets value of SCAN ATTEN
- UP and DN step all DACs by power of 2
- <CR>|<LF>|<ETX>|;|, set all DACs to the specified value.

- **KSK;**  
Moves the active marker to the next highest peak.
- **KSK;**  
Counts the pilot IF at the marker.
- KSL;**  
Turns off the average noise level marker. Selected with IP.
- KSM;**  
Returns the average value at the marker, normalized to a 1 Hz bandwidth.
- **KSN;**  
Moves the active marker to the minimum value detected.
- **KSN;**  
Counts the voltage-controlled oscillator at the marker.
- KSO;**  
Moves the marker delta frequency into the frequency span.
- KSP<integer>HZ;**  
Sets the analyzer's HP-IB address.
- **KSQ;**  
Unlocks the frequency band.
- **KSQ;**  
Counts the signal intermediate frequency.
- KSR;**  
Turns the frequency diagnostics on.
- **KSS;**  
Selects fast HP-IB I/O format.
- **KSS;**  
Automatically determines the second LO frequency. Selected with IP.
- **KST;**  
Performs a fast preset, 2–22 GHz.
- **KST;**  
Shifts the second LO down.
- **KSU;**  
Performs an external mixer preset.
- **KSU;**  
Shifts the second LO up.

**KSV**[\_(<real>[HZ|KZ|MZ|GZ])|EP|?];  
Specifies the frequency offset for all absolute frequency readouts such as center frequency. Default units are Hz.  
Query response: <numeric data format>

**KSW**;  
Performs an amplitude error correction routine.

**KSX**;  
Incorporates the correction data (see KSW) in amplitude readouts.

**KSY**;  
Does not incorporate the correction data in amplitude readouts.

**KSZ**[\_(<real>[DM|MV|UV|])|EP|?];  
Specifies the reference level offset. Default units are dB.  
Query response: <numeric data format>

**KSa**;  
Selects normal detection. Selected with IP.

**KSb**;  
Selects positive peak detection.

**KSc**;  
Adds trace A and trace B and sends the result to trace A.

**KSd**;  
Selects negative peak detection.

**KSe**;  
Selects sample detection.

**KSf**;  
Recovers the last instrument state at power on.

**KSg**;  
Turns off the CRT beam.

**KSh**;  
Turns on the CRT beam.

**KSi**;  
Exchanges trace B and trace C.

**KSj**;  
Views trace C.

**KSk**;  
Blanks trace C.

- KSI;**  
Moves trace B into trace C.
- KSm;**  
Turns off the graticule.
- KSn;**  
Turns on the graticule. Selected with IP.
- KSo;**  
Turns off the annotation.
- KSp;**  
Turns on the annotation. Selected with IP.
- KSq;**  
Decouples the IF gain and the RF input attenuation.
- KSr;**  
Sets service request 102.
- **KSt;**  
Locks the frequency band.
- **KSt;**  
Continues sweeping from the marker.
- KSu;**  
Stops the sweep at the active marker when the analyzer is in single sweep mode. (See S1 or SNGLS.)
- **KSv;**  
Identifies signals for external mixing frequency bands.
- **KSv;**  
Inhibits the phase lock.
- KSw;**  
Displays the amplitude error correction data.
- KSx;**  
Sets the trigger mode to external, but eliminates the auto-refresh.
- KSy;**  
Sets the trigger mode to video, but eliminates the auto-refresh.
- KSz;**  
Sets the display storage address.



**KS,[\_(<real>[DM|MV|UV])|EP|?];**  
Specifies the mixer level. Default units are dBm.  
<real>:: = integer multiple of 10.  
Query response: <numeric data format>

● **KS=;**  
Selects the factory preselector setting.

■ **KS=[\_(<real>[HZ|KZ|MZ|GZ])|EP|?];**  
Specifies the resolution of the marker frequency counter. Default units are Hz.  
Query response: <numeric data format>

**KS(;**  
Locks the save registers.

**KS);**  
Unlocks the save registers.

**KS|;**  
See DW.

■ **KS>[\_(<real>[DB])|EP|?];**  
Specifies the preamp gain for signal input 2. Default units are dB.  
Query response: <numeric data format>

■ **KS<[\_(<real>[DB])|EP|?];**  
Specifies the preamp gain for signal input 1. Default units are dB.  
Query response: <numeric data format>

● **KS#;**  
Turns off the YTX self-heating correction.

● **KS/;**  
Allows the preselector to be peaked manually.

**KS{39}<display memory address><display write commands><terminator>**  
Writes to display memory in fast binary.  
<display memory address>:: = two 8-bit binary bytes  
<display write commands>:: = two 8-bit binary bytes

● **KS{43}<terminator>**  
Sets SRQ 102 when the frequency limit is exceeded.

**KS{91};**  
Returns the amplitude error.

**(DL|TH|M2|M3|); KS{92}<value><terminator>**  
Specifies the value of the display line, threshold, active marker, or the delta marker in display units.  
<value>:: = integer in display units

●**KS{94};**

Returns the code for the harmonic number in binary.

**(O1|O2|O3|O4);DA<display memory address>;KS{123};**

Returns up to 1001 words of display memory beginning at the address specified.

**DA<display memory address>;KS{125}<entry>;**

Writes up to 1001 display memory words (two bytes per word), beginning at the address specified.

<entry>:: = up to 2002 eight bit binary bytes

**(O1|O2|O3|O4);DA<display memory address>;KS{126}<N>;**

Returns every Nth value of a trace.

<N>:: = integer from 1 to 1001

**DA<display memory address>;KS{127}<entry>;**

Prepares the analyzer to accept binary display write commands, input as a part of 2 eight bit bytes.

<entry>:: = the number of pairs of bytes to be sent as a pair of 2 eight bit bytes.

## L

**LB<character string><label terminator>;**

Writes the specified characters on the CRT display. The first character appears at the current CRT beam position. (See PA and PR.)

<character string>:: = any ASCII character

<label terminator>:: = <ETX>|<character specified in DT command>

●**LF;**

Presets the analyzer 0 – 2.5 GHz.

**LG\_<sub>1</sub>[(<integer>[DB])|UP|DN|EP|?];**

Specifies the scale of the logarithmic display. Default units are dB. 10 dB per division is selected with IP.

Query response:: = <numeric data format>

A query response of zero indicates a linear scale.

**LL;**

Provides the lower left recorder output voltage at the rear panel.

**LN;**

Selects the linear scale.

**LOG\_<sub>1</sub><destination>,<operand 1>,<scaling factor>**

The log of the operand is taken, multiplied by the specified scaling factor and the result is sent to the destination.

<scaling factor>:: = <variable identifier>|<numeric data field>;

**LO;**

Turns off the display line.

## M

**[O1|O2|O3|O4:]MA;**

Returns the amplitude of the active marker.

**MBRD\_<analyzer memory address>,<number of bytes>**

Reads the specified number of bytes starting at the specified address and returns the bytes to the controller.

<number of bytes>:: = ASCII decimal number indicating the number of bytes to be read

**MBWR\_<analyzer memory address>(<string data field>|<block data field>);**

Writes the specified data field into the analyzer's memory starting at the specified address.

■ **MC0;**

Turns off the marker frequency counter. Selected with IP.

■ **MC1;**

Turns on the marker frequency counter.

**MDS\_B|W|?;**

Formats binary measurements by selecting the measurement data size as an 8-bit byte or a two-byte word. IP sets the data size to word.

Query response: B|W

**MDU?;**

Returns the values of the CRT base line and reference level, in display units and measurement units.

**MEAN\_<trace label>|TRA|TRB|TRC;**

Returns the mean value of a trace in display units.

**MEM?;**

Returns the amount of allocatable memory available for user-defined commands in bytes. These commands include TRDEF, VARDEF, FUNCDEF, ONEOS, ONSWP, and TRMATH.

**[O1|O2|O3|O4:]MF;**

Returns the frequency of the active marker.

**MIN\_<destination>,<operand 1>,<operand 2>;**

Compares operand 1 and operand 2, point by point, and sends the lesser value of each comparison to the destination.

**MKA[\_(<real>[DM])|EP|?];**

Specifies the amplitude of the active marker. Default units are dBm.

Query response: <numeric data format>

**MKACT[\_1|2|3|4|?];**

Establishes the number of the active marker. Up to four markers can be displayed at one time but only one marker can be active at any time.

Query response: 1|2|3|4

**MKCF;**

Moves the active marker to the center frequency.

**MKCONT;**

Continues sweeping from the marker after the marker has been stopped.

(See MKSTOP.)

**MKD[\_(<real>[HZ|KZ|MZ|GZ])|UP|DN|EP|?];**

Places a second marker the specified frequency from the active marker. Frequency may be positive or negative. Default units are Hz.

Query response: <numeric data format>

**MKF[\_(<real>[HZ|KZ|MZ|GZ])|EP|?];**

Specifies the frequency of the active marker. Default units are Hz.

Query response: <numeric data format>

**■ MKFC\_ON|OFF;**

Counts the marker frequency for a more accurate readout of the marker frequency. The accuracy is determined by the MKFCR command.

**■ MKFCR[\_(<real>[HZ|KZ|MZ|GZ])|EP|?];**

Specifies the resolution of the marker frequency counter.

Query response: <numeric data format>

**MKMIN;**

Moves the active marker to the minimum signal detected.

**MKN[\_(<real>[HZ|KZ|MZ|GZ])|UP|DN|EP|?];**

Moves the active marker to the specified frequency. Default units are Hz.

Query response: <numeric data format>

**MKNOISE\_ON|OFF|?;**

Returns the average value at the marker, normalized to a 1 Hz bandwidth.

Query response: ON|OFF

**MKOFF[\_ALL];**

Turns all markers or the active marker off. Up to four markers can be displayed at one time. (See MKACT.)

**MKP\_<integer>|EP|?;**

Specifies the horizontal position of the marker, in display units.

<integer>:: = integer number from 0 to 1001.

Query response: <integer>

**MKPAUSE\_**<delay time>|?;

Pauses the sweep at the active marker for the duration of the delay time, in seconds.

<delay time>:: = real number from 0 to 1000 seconds

Query response: <delay time>

**MKPK**[HI|NH|NR|NL];

Moves the active marker to the maximum signal detected or to the next highest, next right, or next left signal detected. Marker defaults to maximum signal detected.

**MKPX\_**(<real>[DB])|EP|?;

Specifies the minimum excursion for peak identification. Default units are dB. IP selects 6 dB for minimum excursion.

Query response: <numeric data format>

**MKREAD\_FRQ**|PER|SWT|IST|FFT|?;

Specifies the marker readout mode.

Query response: FRQ|PER|SWT|IST|FFT

**MKRL**;

Moves the active marker to the reference level.

**MKSP**;

Moves the marker delta frequency into the frequency span.

**MKSS**;

Moves the marker frequency into the center frequency step size.

**MKSTOP**;

Stops the sweep at the active marker.

**MKTRACE\_TRA**|TRB|TRC|?;

Moves the active marker to the corresponding position on another trace.

Query response: TRA|TRB|TRC

**MKTRACK\_ON**|OFF|?;

Turns the marker signal track on or off.

Query response: ON|OFF

**MKTYPE\_PSN**|FIXED|AMP|?;

Specifies the type of active marker to be used.

Query response: PSN|FIXED|AMP

**ML\_**(<real>[DM|MV|UV])|EP|?;

Specifies the mixer level. Default units are dBm.

<real>:: = integer multiple of 10

Query response: <numeric data format>

**MOV\_**<destination>,<operand 1>;

Moves the operand to the destination.

**MPY\_**<destination>,<operand 1>,<operand 2>;  
Multiplies the operands, point by point, and sends the result to the destination.

**MRD\_**<analyzer memory address>;  
Reads the two-byte word at the specified memory address and returns it to the controller. The address must be an even number.

**MRDB\_**<analyzer memory address>;  
Reads the 8-bit byte at the specified memory address and returns its ASCII equivalent to the controller.

**MT0;**  
Turns off the marker signal track. Selected with IP.

**MT1;**  
Turns on the marker signal track.

**MWR\_**<analyzer memory address>,<message>;  
Writes a two-byte message, starting at the specified memory address.  
<message>:: = ASCII decimal number representing two-byte word.

**MWRB\_**<analyzer memory address>,<message>;  
Writes a one-byte message to the specified memory address.  
<message>:: = ASCII decimal number representing one 8-bit byte

**MXM\_**<destination>,<operand 1>,<operand 2>;  
Compares operand 1 and operand 2, point by point, and sends the greater value of each comparison to the destination.

**MXMH\_TRA|TRB;**  
Updates each trace element with the maximum level detected.

**M1;**  
Turns off all markers. Selected with IP.

**M2\_**(<real>[HZ|KZ|MZ|GZ])|UP|DN|EP|?);  
Moves the active marker to the specified frequency. Default units are Hz.  
Query response: <numeric data format>

**M3\_**(<real>[HZ|KZ|MZ|GZ])|UP|DN|EP|?);  
Places a second marker the specified frequency from the active marker. Frequency may be positive or negative. If no frequency is specified, the marker is placed on the active marker. Default units are Hz.  
Query response: <numeric data format>

**M4\_**(<real>[HZ|KZ|MZ|GZ])|UP|DN|EP|?);  
Moves the active marker to the specified frequency. Stepping up or down changes the frequency span. Default units are Hz.  
Query response: <numeric data format>

## O

### OA;

Returns the active function value.

### OL;

Returns the coded instrument state information to the controller in 80 8-bit binary bytes.

### ONEOS<string data field>|<block data field>|?;

Executes the specified command(s) at the end of every sweep.

Query response: <A-block data format>

### ONSWP<string data field>|<block data field>|?;

Executes the specified command(s) at the start of every sweep.

Query response: <A-block data format>

### OP?;

Returns the parameters which represent the dimensions of the lower left and upper right vertices of the analyzer display, in display units.

### OT;

Returns all CRT annotation as 32 strings. The strings are from 0 (null) to 64 characters long. Each string is terminated with a <CR><LF> and the last string is terminated with an EOI upon <LF>.

### O1;

Selects the output format as ASCII integers representing display units or display memory instruction words.

### O2;

Selects the output format as two 8-bit binary bytes.

### O3;

Selects the output format as real numbers in Hz, volts, dBm, or seconds. Selected with IP.

### O4;

Selects the output format as one 8-bit binary byte.

## P

### [D1|D2|D3;]DA<display memory address>;PA[PU|PD]<x position>,<y position>;

Draws vectors to the specified x and y positions. PU and PD determine whether the vector(s) are displayed or blanked. As many x-y position pairs as desired may be entered.

<x position>:: = positive integer in display units

<y position>:: = positive integer in display units

**PD;**

Turns on the beam to display the vector. (See PA.) Selected with IP.

**PDA\_<trace label>,<trace source>,<resolution>;**

Finds the probability density in amplitude of the specified trace source and sends the result to the destination which is a trace label.

<resolution>:: = real number in dB specifying the resolution of each trace point in the destination trace. If a linear scale is used, specify the resolution as the percent of the total number of trace elements (1000).

**PDF\_<trace label>,<trace source>;**

Finds the probability density in frequency of the specified trace source and sends the result to the destination which is a trace label. The TH command may be previously set to specify the minimum signal level of interest.

**PEAKS\_<trace destination>,<trace source>,(AMP|FRQ);**

Sorts the signal peaks in the source trace by amplitude or frequency and returns the number of peaks found to the controller. It also sends the sorted results to the destination trace.

**PLOT\_P1x,P1y,P2x,P2y;**

Plots the CRT display on any HP-IB plotter.

P1x and P1y:: = plotter dependent values that specify the lower left plotter dimension.

P2x and P2y:: = plotter dependent values that specify the upper right plotter dimension.

**●PP;**

Peaks the preselector.

**[D1|D2|D3;];DA<display memory address>;PR[PU|PD]<x position>,<y position>;**

Draws vectors relative from the last absolute position. (See PA.) As many x-y position pairs as desired may be entered.

<x position>:: = positive or negative integer in display units

<y position>:: = positive or negative integer in display units

**[DA<display memory address>;]PS;**

Skips the display program from the specified address to the next page of display memory.

**PU;**

Turns off the CRT beam to blank a vector(s).

**PWRBW\_(<trace label>|TRA|TRB|TRC),<percent of total power>;**

Computes the combined power of all signal responses in the specified trace and returns the bandwidth of the specified percentage of the total power.

<percent of total power>:: = real number from 0 to 100



## R

**RB\_(<real>[HZ|KZ|MZ|GZ])UP|DN|EP|?];**

Specifies the resolution bandwidth. Default units are Hz.

Query response: <numeric data format>

**RC\_<digit>;**

Recalls the previously saved state stored in registers 0 through 9.

<digit>:: = 0|1|2|3|4|5|6|7|8|9

**RCLS\_<digit>;**

Recalls the previously saved state stored in registers 0 through 9.

<digit>:: = 0|1|2|3|4|5|6|7|8|9

**REPEAT\_<command list>UNTIL<flow operand 1>,(GT|LT|EQ|NE|GE|LE),<flow operand 2>;**

Delimits the top of the REPEAT UNTIL looping construct. (See UNTIL.)

**REV;**

Returns the firmware revision number of the analyzer being used.

**RL\_(<real>[DM|MV|UV])UP|DN|EP|?];**

Specifies the reference level. Default units are dBm.

Query response: <numeric data format>

**RMS\_(<trace label>|TRA|TRB|TRC);**

Returns the RMS value of a trace, in display units.

**ROFFSET\_(<real>[DM|MV|UV])EP|?];**

Specifies the reference level offset. Default units are dBm.

Query response: <numeric data format>

**RQS\_<integer>|?;**

Specifies a mask which allows the bits that are not masked for service request.

<integer>:: = ACHII decimal number, 0 – 255

Query response: returns the decimal weighting of the status byte bits which are enabled during a service request.

**R1;**

Resets service request 140 (illegal command).

**R2;**

Allows service requests 140 (illegal command) and 104 (end of sweep).

**R3;**

Allows service requests 140 (illegal command) and 110 (hardware broken).  
Selected with IP.

**R4;**

Allows service requests 140 (illegal command) and 102 (units key pressed or, for HP 8566B, frequency limit exceeded).

## S

### **SAVES\_**<digit>;

Saves the current state of the analyzer in the specified state register.

<digit>:: = 1|2|3|4|5|6

### **SMOOTH\_**(<trace label>|TRA|TRB|TRC),<number of points>;

Smooths the specified trace according to the number of points specified for the running average.

<number of points>:: = integer between 1 and 31

### **SNGLS;**

Selects single sweep mode.

### **SP\_**(<real>[HZ|KZ|MZ|GZ])|UP|DN|EP?];

Specifies the frequency span. Default units are Hz.

Query response: <numeric data format>

### **SQR\_**<trace destination>,<trace source>;

Computes the square root of the source and sends the result to the destination.

### **SRQ\_**<operand>;

Sets a service request if the operand bits are allowed by RQS.

<operand>:: = integer from 0 to 255

### **SS\_**(<real>[HZ|KZ|MZ|GZ])|UP|DN|EP?];

Specifies the center frequency step size. Default units are Hz.

Query response: <numeric data format>

### **ST\_**(<real>[SC|MS|US])|UP|DN|EP?];

Specifies the sweep time per division. Default units are seconds per division.

Query response: <numeric data format>

### **STDEV\_**<trace label>|TRA|TRB|TRC;

Returns the standard deviation of the specified trace amplitude, in display units.

### **SUB\_**<destination>,<operand 1>,<operand 2>;

Subtracts operand 2 from operand 1, point by point, and sends the result to the destination.

### **SUM\_**<trace label>|TRA|TRB|TRC;

Sums the amplitude of each trace element, and returns the sum to the controller.

### **SUMSQR\_**(<trace label>|TRA|TRB|TRC);

Squares the amplitude of each trace element, and returns the sum of the squares to the controller.

**SV\_<digit>;**

Saves the current state of the analyzer in the specified state register.

<digit>:: = 1|2|3|4|5|6

**[DA<display memory address>;]SW;**

Skips from the current address or the specified address to the next control word.

**S1;**

Selects continuous sweep mode. Selected with IP.

**S2;**

Selects single sweep mode.

## T

**[O1|O2|O3|O4;]TA;**

Returns 1001 trace amplitude values for trace A, beginning with the trace point most to the left.

**[O1|O2|O3|O4;]TB;**

Returns 1001 trace amplitude values for trace B, beginning with the trace point most to the left.

**TDF\_A|B|I|M|P?;**

Formats trace information for return to the controller. IP selects O3 format.

A:: = returns data as an A-block data field

B:: = enables O2 or O4 format. See MDS for data size determination.

I:: = returns data as an I-block data field

M:: = enables O1 format

P:: = enables O3 format

Query response: A|B|I|M|P

**TEXT\_<string delimiter><text><string delimiter>;**

Writes text on the spectrum analyzer screen at the current pen location.

<string delimiter>:: = !|"|\$|%|'|/|:|=|@|\|~|^

(must match at beginning and end of text)

<text>:: = alphanumeric ASCII characters 32 through 126

**TH\_(<real>[DM|MV|UV])|UP|DN|EP?;**

Blanks signal responses below the specified threshold level. Default units are dBm. Default level is 9 major divisions below the reference level.

Query response: <numeric data format>

**THE\_ON|OFF?;**

Turns the threshold on or off.

Query response: ON|OFF

**IF\_**<flow operand 1>,(GT|LT|EQ|NE|GE|LE),<flow operand 2>**[THEN]**  
<command list>**[ELSE**<command list>**ENDIF;**

Compares flow operand 1 to flow operand 2. If the condition is true, the command list is executed. Otherwise, commands following the next ELSE or ENDIF statements are executed.

**TM\_FREE**|VID|LINE|EXT|?;

Selects the trigger mode.

Query response: FREE|VID|LINE|EXT

**TRDEF\_**<trace label>[,(<trace length>|?)];

Defines the name and length of a user-defined trace. Default trace length is 1001.

<trace length>:: = integer from 0 to 1008

Query response: <trace length>

**TRDSP\_**(TRA|TRB|TRC), (ON|OFF|?);

Turns the specified trace on or off but continues taking information.

Query response: (TRA|TRB|TRC)(ON|OFF)

**TRGRPH\_**<display address>,<x position>,<y position>,<expanding factor>,<(<trace label>|TRA|TRB|TRC)>;

Displays a compressed (see COMPRESS) trace anywhere on the spectrum analyzer display. The x and y positions orient the trace positions.

<x position>:: = integer from 1 to 1008

<y position>:: = integer from 1 to 1008

<expanding factor>:: = real

**TRMATH**<string data field>|<block data field>|?;

Executes the specified trace math or user-operator commands at the end of a sweep.

Allowable commands in TRMATH:

AMB, AMBPL, APB, AXB, BL, BML, BTC, BXC, C1, C2, EX, KSG, KSH, KSC, KSi, KSI, MOV, MIN, SUB, XCH, ADD, SQR, MPY, CON-

CAT, DIV, CTM, LOG, CTA, EXP, AVG, MXM

Query response: <A-block data format>

**TRPRST;**

Sets trace operations to their preset values.

**TRSTAT;**

Returns the current trace status to the controller: clear-write, off, view, or blank.

**TS;**

Takes a sweep.

**TWINDOW\_**<trace label>(UNIFORM|HANNING|FLATTOP);

Formats trace information for fast fourier analysis (FFT). This trace label should be used as the <window> in the FFT command.

UNIFORM: for FFT of transient signals and random noise. This window has the least frequency uncertainty.

HANNING: offers a compromise between the UNIFORM window and the FLATTOP window.

FLATTOP: for FFT of periodic signals. This window has the least amplitude uncertainty.

**T0;**

Turns the threshold level off. Selected with IP.

**T1;**

Sets the trigger mode to free run. Selected with IP.

**T2;**

Sets the trigger mode to line.

**T3;**

Sets the trigger mode to external.

**T4;**

Sets the trigger mode to video.

## U

**REPEAT\_**<command list>**UNTIL**<flow operand 1>,(GT|LT|EQ|NE|GE|LE),<flow operand 2>;

Compares the operands and repeats the command list until the condition on the operands is true.

**UR;**

Provides the upper right x-y recorder output voltage at the rear panel.

**USTATE\_**<A-block data field>|?;

Configures or returns the configuration of the user-defined trace: ONEOS, ONSWP, TRMATH, VARDEF, FUNCDEF, TRDEF.

Query response: <A-block data format>

## V

**VARDEF\_**<variable identifier>,<initial value>;

Defines a variable name and assigns an initial value to it. IP reassigns the initial value to the variable name.

<initial value>:: = <real>

**VAVG\_**<average length>|ON|OFF;

Turns the video averaging on or off.

<average length>:: = real and represents the maximum number of sweeps executed for averaging. Default length is 100.

**VB[\_(<real>[HZ|KZ|MZ|GZ])UP|DN|EP?];**

Specifies the video bandwidth. Default units are Hz.

Query response: <numeric data format>

**VBO\_(+|-)<integer>;**

Specifies the ratio between the video bandwidth and the resolution bandwidth. For example, an entry of +1 sets the video bandwidth one bandwidth step higher than the resolution bandwidth.

**VARIANCE\_(<trace label>|TRA|TRB|TRC);**

Returns the amplitude variance of the specified trace.

**VIEW\_TRA|TRB|TRC;**

Stores and views the specified trace.

**X**

**XCH\_<destination>,<destination>;**

Exchanges the contents of the destinations.

## Programming Codes Developed Too Late for Itemized Listings

- **CNVLOSS\_<real>[DB];**

Selects the reference level offset to amplitude calibrate the display for a mixer with a given conversion loss. Default units are dB.  
<real>:: = real number from 0 to 60

- **EXTMXR;**

Performs an external mixer preset. Start frequency 18 GHz; Stop frequency 26.5 GHz.

- **FULBAND\_<digit>;**

Sets the start and stop frequencies for full waveguide bands.  
<digit>:: = integer from 6 to 17 indicating the following:

Band	Frequency Range	Mixing Harmonic
6 (K)	18.0 – 26.5 GHz	6+
7 (A)	25.5 – 40.0	8+
8 (Q)	33.0 – 50.0	10+
9 (U)	40.0 – 60.0	10+
10 (V)	50.0 – 75.0	14+
11 (E)	60.0 – 90.0	16+
12 (W)	75.0 – 110.0	18+
13 (F)	90.0 – 140.0	24+
14 (D)	110.0 – 170.0	30+
15 (G)	140.0 – 220.0	36+
16 (Y)	170.0 – 260.0	44+
17 (J)	220.0 – 325.0	54+

- **HNLOCK[<digit>;]**

Locks to the specified harmonic number to prevent multi-harmonic sweeps and to prevent tuning past the 2 GHz to 6.2 GHz L.O. tuning range.  
<digit>:: = integer from 1 to 64

- **HNUNLK;**

Turns off the harmonic lock (see HNLOCK) allowing tuning over the entire analyzer input range.

- **IDSTAT?;**

Returns the completion status of the signal identifier.  
Query response: 1 signal found  
                  0 no signal found  
                  -1 signal found but cannot be reached on locked harmonic

- **NSTART\_<digit>;**

Specifies the start harmonic for signal identification.  
<digit>:: = integer from 5 to 64

- **NSTOP\_<digit>;**  
Specifies the stop harmonic for signal identification.  
<digit>:: = integer from 5 to 64
- **SIGDEL\_<integer>[DB];**  
Specifies the maximum amplitude difference allowed between a signal and its image for the pair to be recognized by the signal identification routine.  
Default units are dB.  
<integer>:: = integer from 0 to 35 in steps of 5.
- **SIGID;**  
Identifies signals for external mixing frequency bands.

### Secondary Keyword Summary

ALL	all
AMP	amplitude
AVG	average detection
B	8-bit byte
DB	decibel (unit)
DBM	absolute decibel milliwatt unit
DBMV	decibel millivolt
DBUV	decibel microvolt
DELTA	delta
DM	absolute decibel milliwatt unit
DN	decrement the parameter
EP	enable parameter for front panel operator entry
EQ	equal
EXT	external
FFT	fast fourier transform
FIXED	fixed
FREE	free run
FRQ	frequency
GE	greater than or equal
GT	greater than
GZ	gigahertz (unit)
HI	highest
HZ	hertz
IST	inverse sweep time
KZ	kilohertz (unit)
LE	less than or equal
LINE	line, as in power line
LT	less than
MS	millisecond (unit)
MV	millivolts (unit)
MZ	megahertz (unit)
NE	not equal to
NEG	negative peak detection

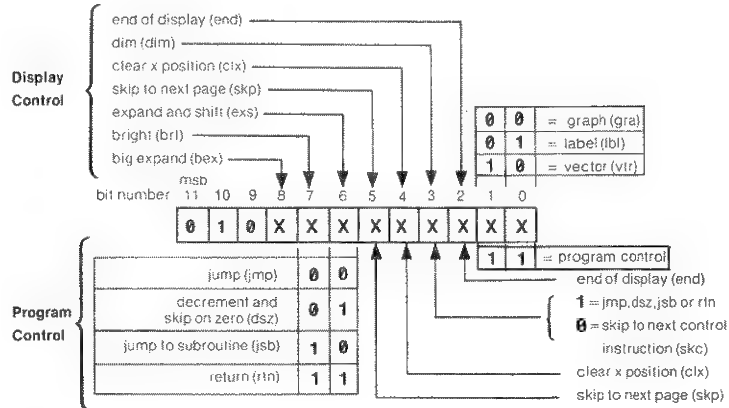


NH	next highest
NL	next left
NR	next right
NRM	normal rosenfell detection
OFF	turn function off
ON	turn function on
PER	period
PK-PIT	peak-to-peak average detection
PK-AVG	peak minus average detection
POS	positive peak detection
PSN	position
SC	seconds (unit)
SMP	sample detection
SWT	sweep time
TRA	trace A
TRB	trace B
TRC	trace C
UP	increment the parameter
UV	microvolts (unit)
US	microseconds (unit)
V	volts (unit)
VID	video
W	2-byte word
?	returns a query response containing the value or state of the associated parameter

## APPENDIX A

### CONSOLIDATED CODING FOR DISPLAY PROGRAMMING

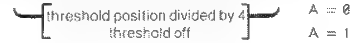
#### INSTRUCTIONS



#### Load Counter (ldc)

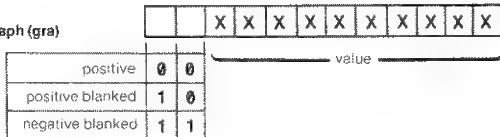


#### Threshold



#### DATA:

##### Graph (gra)



##### Character



##### Vector (vtr)



R = 1 relative vector; R = 0 absolute vector  
B = 1 pen up; B = 0 pen down



**HEWLETT  
PACKARD**

## **SPECIFICATIONS**

# **8568B SPECTRUM ANALYZER**

**Includes Option 001 and 400**

## **SERIAL NUMBERS**

This manual applies directly to Model 8568B RF Sections with serial numbers prefixed 2408A and IF-Display Sections with serial numbers prefixed 2403A.

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1212 VALLEY HOUSE DRIVE  
ROHNERT PARK, CALIFORNIA 94928, U.S.A.**

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# SPECIFICATIONS

---

## INTRODUCTION

Unless noted, all specifications are for AUTO COUPLED FUNCTION operation. Where specifications are subject to minimization with the error correction routine, corrected limits are given unless noted.

## SPECIFICATIONS

---

### FREQUENCY

#### MEASUREMENT RANGE:

100 Hz to 1500 MHz through two RF inputs: 100 Hz to 1500 MHz dc coupled and 100 kHz to 1500 MHz ac coupled.

#### DISPLAYED RANGE

##### Frequency Span

100 Hz to 1500 MHz over 10 divisions CRT horizontal axis.  
Variable from data knob, or numeric/unit keyboard.

Step keys change span in a 1,2,5 sequence.

In zero span, the instrument is fixed tuned at the center frequency.

**Full Span** (0 – 1500 MHz) is immediately executed with 0 – 1.5 GHz or INSTR PRESET keys.

**Frequency Span Accuracy:** For spans >1 MHz,  $\pm (2\%$  of the actual frequency separation between two points 0.5% span); for spans  $\leq 1$  MHz,  $\pm (5\%$  of frequency separation + 0.5% span).

##### Center Frequency

0 Hz to 1500 MHz.

Variable from data knob or numeric/unit keyboard.

Center frequency step size may be set to any value through the numeric keyboard or using the MKR/ $\Delta$ →STOP SIZE key. Center frequency may also be set using MKR→CF or SIGNAL TRACK keys.

## SPECIFICATIONS

### FREQUENCY (Cont'd)

#### Readout Accuracy:

**Span  $\geq 100$  Hz:**  $\pm (2\% \text{ of frequency span} + \text{frequency reference error} \times \text{tune frequency} + 10 \text{ Hz})$  after adjusting FREQ ZERO at stabilized temperature.

#### Zero Frequency Span:

Resolution Bandwidth	Accuracy: Frequency Reference Error x Tune Frequency +	Readout Resolution
10 – 300 Hz	10 Hz	1 Hz
1K – 3 kHz	100 Hz	10 Hz
10K – 3 MHz	1 kHz	100 Hz

#### Start-Stop Frequency

Continuously variable from data knob, step keys, or numeric keyboard. Permissible values must be consistent with those for center frequency and frequency span. SHIFT O sets the analyzer start and stop frequencies equal to the frequencies of the two  $\Delta$  markers.

**Readout Accuracy:** Center Frequency Readout Accuracy +  $1/2$  Frequency Span Accuracy. CRT display frequency readouts may be offset from their actual values by the amount entered through the numeric/unit keyboard after executing SHIFT V.

## MARKER

### Normal

Displays the frequency at the horizontal position of the tunable marker.

**Accuracy:** Center frequency accuracy + frequency span accuracy between marker and center frequencies.

PEAK SEARCH positions the marker at the center of the largest signal response present on the display to within  $\pm 10\%$  of resolution bandwidth.

MKR $\rightarrow$ CF sets the analyzer center frequency equal to the marker frequency; MKR/ $\Delta$  $\rightarrow$ STP SIZE sets the center frequency step size equal to the marker frequency.

## SPECIFICATIONS

---

### FREQUENCY (Cont'd)

#### Frequency Count

Displays the frequency of the signal on whose response the marker is positioned. The marker must be positioned at least 20 dB above the noise or the intersection of the signal with an adjacent signal and more than four divisions up from the bottom of the CRT.

Counter resolution is normally a function of frequency span but may be specified directly using SHIFT = .

**Accuracy:** For span  $\leq 100$  kHz: frequency reference error  $\times$  displayed frequency  $\pm 2 \times$  frequency counter resolution  
For span  $> 100$  kHz but  $\leq 1$  MHz: freq. ref. error  $\times$  displayed frequency  $\pm 10$  Hz  $+ 2 \times$  frequency counter resolution. For spans  $> 1$  MHz:  $\pm 10$  kHz  $+ 1$  count.

**Frequency Reference Error**, after 30 day warm-up (see also STABILITY Drift):

#### Aging Rate

$< 1 \times 10^{-9}/\text{day}$

#### Temperature Stability

$< 7 \times 10^{-9} 0^\circ \text{ to } 55^\circ\text{C}$

#### Signal Track

Re-tunes the analyzer to place a signal identified by the marker at the center of the CRT and maintain its position. Useful when reducing frequency span to zoom-in on a signal; also keeps a drifting input signal centered.

$\Delta$

Displays the frequency difference between the stationary and tunable markers. Reference frequency need not be displayed.

**Accuracy:** same as frequency span accuracy; in the FREQ COUNT mode, twice the frequency count uncertainty plus drift during the period of the sweep. (See STABILITY Drift.)

MKR/ $\Delta$   $\rightarrow$  STP SIZE sets the center frequency step size equal to the frequency difference between the markers. SHIFT O sets the analyzer start and stop frequencies equal to the frequencies of the two markers.

## SPECIFICATIONS

---

### FREQUENCY (Cont'd)

#### Zoom

Makes it possible to reduce the frequency span about the marker (or signal in the signal track and freq count mode) using the step down key.

#### RESOLUTION

##### Resolution Bandwidth

3 dB bandwidths of 10 Hz to 3 MHz in a 1,3,10 sequence.

Bandwidth may be selected manually or coupled to frequency span.

**Bandwidth Accuracy:** Calibrated to:

$\pm 10\%$ , 1 MHz to 3 kHz

$\pm 20\%$ , 1 kHz to 10 Hz, 3 MHz bandwidths

30 kHz and 100 kHz bandwidth accuracy figures only applicable  $\leq 90\%$  R.H.

##### Bandwidth Selectivity

60 dB/3 dB bandwidth ratio:

<15:1, 3 MHz to 100 kHz

<13:1, 30 kHz to 10 kHz

<11:1, 3 kHz to 30 Hz

60 dB points on 10 Hz bandwidth are separated by <100 Hz.



## SPECIFICATIONS

---

### FREQUENCY (Cont'd)

#### STABILITY

##### Residual FM

<3 Hz peak-to-peak  $\leq 10$  sec; span <100 kHz, resolution bandwidth  $\leq 30$  Hz, video bandwidth  $\leq 30$  Hz.

**Drift** (After 1 hr. warm-up at stabilized temperature):

Frequency Span	Drift (per minute of SWEPTIME)
$\leq 100$ kHz	<10 Hz
>100 kHz but $\leq 1$ MHz	<100 Hz
>1 MHz	<300 kHz

Because the analyzer is frequency corrected on retrace, drift occurs only during the period of one sweep. This drift is in addition to frequency reference error due to aging.

#### SPECTRAL PURITY

##### Noise Sidebands

Offset from Carrier	SSB Phase Noise (1 Hz BW)
300 Hz	-90 dBc
3 kHz	-100 dBc
30 kHz	-107 dBc

##### Line Related Sidebands

>85 dB below the peak of a CW signal.

## SPECIFICATIONS

---

### AMPLITUDE

#### MEASUREMENT RANGE

– 135 dBm to + 30 dBm.

#### DISPLAYED RANGE

##### Scale

Over a 10 division CRT vertical axis with the Reference Level (0 dB) at the top graticule line.

##### Calibration

**Log:** 10 dB/div for 90 dB display from Reference Level  
5 dB/div for 50 dB display } expanded from  
2 dB/div for 20 dB display } Reference Level  
1 dB/div for 10 dB display }

**Linear:** 10% of Reference Level/div when calibrated in voltage.

##### Fidelity

###### Log:

**Incremental:**  $\pm 0.1$  dB/dB over 0 to 90 dB display

###### Cumulative:

3 MHz to 30 Hz Res BW

$\leq \pm 1.0$  dB max over 0 to 80 dB display, 20° – 30°C

$\leq \pm 1.5$  dB max over 0 to 90 dB display

10 Hz Res BW

$\leq \pm 2.1$  dB max over 0 to 90 dB display

**Linear:**  $\pm 3\%$  of Reference Level for top 9 1/2 divisions of display.

##### Reference Level

###### Range

**Log:** + 30.0 to – 99.9 dBm or equivalent in dBmV, dB $\mu$ V, volts.

Expandable to + 60.0 to – 119.9 dBm (– 139.9 dBm  $\leq 1$  kHz resolution bandwidth) using SHIFT 1.

## SPECIFICATIONS

---

### AMPLITUDE (Cont'd)

**Linear:** 7.07 volts to 2.2  $\mu$ volts full scale.

Expandable to 223.6 volts to 2.2  $\mu$ volts (0.22  $\mu$ volts < 1 kHz resolution bandwidth) using SHIFT 1.

(Maximum input must not exceed + 30 dBm damage level.)

Continuously variable from data knob or numeric keyboard with 0.1 dB resolution; step keys change level in 10% of full scale increments. Reference level may also be set using the MKR→REF LVL key.

### Accuracy

The sum of the following factors determines the accuracy of the reference level readout. Depending upon the measurement technique followed after calibration, various of these sources of uncertainty may not be applicable.

An internal error correction function calibrates and reduces the uncertainty introduced by analyzer control changes from a state defined during the calibration of the instrument when SHIFT W is executed just prior to the signal measurement (i.e. at the same temperature) within the 20° – 30°C range.

**Calibrator Uncertainty:**  $\pm 0.2$  dB

**Frequency Response (Flatness) Uncertainty:**  $\geq 10$  dB

#### RF Attenuation

Input #1:  $\pm 1$  dB, 100 Hz to 500 MHz

$\pm 1.5$  dB, 100 Hz to 1500 MHz

Input #2:  $\pm 1$  dB, 100 kHz to 1500 MHz

### Amplitude Temperature Drift:

At – 10 dBm reference level with 10 dB input attenuation and 1 MHz resolution bandwidth,  $\pm 0.05$  dB/°C (eliminated by recalibration).

**Input Attenuation Switching Uncertainty:**

$\pm 1.0$  dB over 10 dB to 70 dB range.

---

## SPECIFICATIONS

### AMPLITUDE (Cont'd)

#### Input Connector Switching UNCERTAINTY:

$\pm 0.5$  dB, applicable when signals measured using different inputs are compared.

#### Resolution Bandwidth Switching Uncertainty:

(referenced to 1 MHz bandwidth)  
corrected (uncorrected)

20° – 30°C		0° – 55°C
Resolution BW	(After 1 hour warm-up)	
10 Hz	$\pm 1.1$ dB ( $\pm 2.0$ dB)	( $\pm 4.0$ dB)
30 Hz	$\pm 0.4$ dB ( $\pm 0.8$ dB)	( $\pm 2.3$ dB)
100 Hz to 1 MHz	$\pm 0.2$ dB ( $\pm 0.5$ dB)	( $\pm 2.0$ dB)
3 MHz	$\pm 0.2$ dB ( $\pm 1.0$ dB)	( $\pm 2.0$ dB)

30 kHz and 100 kHz bandwidth switching uncertainty figures only applicable  $\leq 90\%$  R.H.

#### Log Scale Switching Uncertainty:

Corrected  
20° – 30°C

Uncorrected  
20° – 30°C

Uncorrected  
0° – 55°C

$\pm 0.1$  dB

$\pm 0.5$  dB

$\pm 1.0$  dB

#### IF Gain Uncertainty - corrected (uncorrected):

Assuming the internal calibration signal is used to calibrate the reference level at  $-10$  dBm and the input attenuator is fixed at 10 dB, any changes in reference level in the following ranges will contribute to IF gain uncertainty:

## SPECIFICATIONS

### AMPLITUDE (Cont'd)

Reference Level	20° – 30°C	0° – 55°C
0 to – 55.9 dBm		
10 Hz Resolution BW	± 1.0 dB (± 1.6 dB)	(± 2.0 dB)
≥ 30 Hz Resolution BW	0 dB(± 0.6 dB)	(± 1.0 dB)
– 56.0 to – 129.9 dBm		
10 Hz Resolution BW	(± 2.0 dB)	(± 2.5 dB)
≥ 30 Hz Resolution BW	(± 1.0 dB)	(± 1.5 dB)

Correction Accuracy only applies over 0 dBm to – 55.9 dBm range.

Each 10 dB decrease (or increase) in the amount of input attenuation at the time of calibration and measurement will cause a corresponding 10 dB decrease (or increase) in the absolute reference level settings described above.

**RF Gain Uncertainty** (due to 2nd LO shift):  
± 0.1 dB corrected (± 1.0 dB uncorrected)

**Error Correction Accuracy**  
(applicable when SHIFT W and SHIFT X are used): ± 0.4 dB

### MARKER

#### Normal

Displays the amplitude at the vertical position of the tunable marker.

**Accuracy:** Equals the sum of calibrator uncertainty, reference level uncertainty, and scale fidelity between the reference level and marker position.

PEAK SEARCH positions the marker at the peak of the largest signal present on the display. MKR→REF LVL sets the analyzer reference level equal to the marker amplitude.

RMS noise density in a 1 Hz bandwidth is read out using SHIFT M, by sampling the displayed trace and arithmetically correcting for the analyzer envelope detector response, log shaping, and measurement bandwidth.

## SPECIFICATIONS

---

### AMPLITUDE (Cont'd)

Δ

Displays the amplitude difference between the stationary and tunable markers. Reference frequency need not be displayed.

**Accuracy:** Equals the sum of scale fidelity and frequency response uncertainty between the two markers.

### REFERENCE LINES

#### Display Line

Movable horizontal line with amplitude readout.

#### Threshold

Movable horizontal trace threshold with amplitude readout.

#### Accuracy

Equals the sum of calibrator uncertainty, reference level uncertainty, and scale fidelity between the reference level and reference line.

### DYNAMIC RANGE

#### Spurious Responses

For total signal power of  $< -40$  dBm at the input mixer of the analyzer, all image and out-of-band mixing responses, harmonic and intermodulation distortion products are  $>75$  dB below the total signal power for input signals 10 MHz to 1500 MHz,  $>70$  dB below the total signal power with input signals  $<10$  MHz.

**Second Harmonic Distortion:** For a signal  $-30$  dBm at the mixer and  $\geq 10$  MHz, second harmonic distortion  $>70$  dB down; 60 dB down for signals  $<10$  MHz.

**Third-Order Intermodulation Distortion:** For two signals each  $-30$  dBm at the mixer, third-order intermodulation products:

## SPECIFICATIONS

---

### AMPLITUDE (Cont'd)

Signal Separation	Center Frequency	Distortion Products	T.O.I
<100 kHz	>100 kHz	>70 dBc	+ 5 dBm
>100 kHz	>10 MHz	>80 dBc	+ 10 dBm

#### **Residual Responses** (no signal at input)

< -105 dBm for frequencies >500 Hz with 0 dB input attenuation.

#### **Average Noise Level**

Displayed < -135 dBm for frequencies >1 MHz, < -112 dBm for frequencies  $\leq$ 1 MHz but >500 Hz with 10 Hz resolution bandwidth, 0 dB input attenuation, 1 Hz video filter.

**Video Bandwidth:** Post detection low pass filter used to average displayed noise; bandwidth variable from 1 Hz to 3 MHz in a 1,3,10 sequence. All bandwidths are nominal except 3 MHz, which is a minimum.

Video bandwidth may be selected manually or coupled to resolution bandwidth.

**Digital Video Averaging:** Displays the sweep-to-sweep average of the trace over a specifiable number of sweeps with SHIFT G; video averaging is turned off with SHIFT H.

#### **Gain Compression**

<0.5 dB for signal levels  $\leq$  -10 dBm at the input mixer.

## SPECIFICATIONS

---

### SWEEP

#### TRIGGER

##### Free Run

Sweep triggered by internal source.

##### Line

Sweep triggered by power line frequency.

##### Video

Sweep triggered by detected waveform of input signal at an adjustable level; signal must be  $\geq 0.5$  div peak-to-peak. For sweeps of 10 msec and less (zero span) the signal must have  $>40$  Hz rate.

SHIFT y allows any envelope rate, but display will blank between triggers when sweep is  $<20$  msec.

##### External

Sweep triggered by rising edge of signal input to rear panel BNC connector; trigger source must be  $>2.4$  volts (5 volts max). For sweep of 10 msec and less (zero span) trigger source must have  $>40$  Hz rate.

SHIFT x allows any trigger source rate but display will blank between low rep rate trigger when sweep is  $<20$  msec.

#### CONTINUOUS

Sequential sweeps initiated by the trigger; 20 msec full span to 1500 sec full span in 1,1.5,2,3,5,7.5,10 sequence.

#### Accuracy

Sweep time  $\leq 100$  sec,  $\pm 10\%$ ;  $>100$  sec,  $\pm 20\%$ .

#### Zero Frequency Span

1  $\mu$ sec full sweep (10 divisions) to 10 msec full sweep in 1,2,5 sequence; 20 msec full sweep to 1500 sec full sweep in 1,1.5,2,3,5,7.5,10 sequence.

**Accuracy:** same as continuous



## SPECIFICATIONS

---

### SWEEP (Cont'd)

**Marker:** (sweeps  $\geq 20$  msec only)

**Normal:** Displays time from beginning of sweep to marker position.

**Accuracy:** Sweep time settings  $\geq 20$  msec but  $\leq 100$  sec,  $\pm 10\%$  x (indicated time/sweep time setting); settings  $> 100$  sec,  $\pm 20\%$  x (indicated time/sweep time setting).

**$\Delta$ :** Displays time difference between stationary and tunable marker.

**Accuracy:** Same as normal.

### SINGLE

Single sweep armed on activation and initiated by trigger (sweep  $\geq 20$  msec only).

## DISPLAY

### CATHODE RAY TUBE

#### Type

Post deflection accelerator, aluminized P31 phosphor, electrostatic focus and deflection.

#### Viewing Area

Approximately 9.6 cm vertically by 11.9 cm horizontally (3.8 in x 4.7 in.).

The CRT is completely turned off with SHIFT g (and on with SHIFT h) to avoid unnecessary aging of the CRT during long term unattended operation of the analyzer.

## SPECIFICATIONS

---

### INPUTS

#### Input #1

100 kHz to 1500 MHz, 50 $\Omega$ , BNC connector (Fused); dc coupled.

**Reflection Coefficient** (typical values): <0.20 (1.5 SWR) to 500 MHz, <0.33 (2.0 SWR) 500 MHz to 1500 MHz;  $\geq 10$  dB input attenuation.

#### Input #2

100 kHz to 1500 MHz, 50 $\Omega$ , Type N connector; ac coupled.

**Reflection Coefficient** (typical values): <0.20 (1.5 SWR);  $\geq 10$  dB input attenuation.

#### Isolation

>85 dB typical isolation between inputs.

Also available: Input #1, 100 Hz to 1500 MHz, 75 $\Omega$ , BNC connector, dc coupled (Option 001).

### MAXIMUM INPUT LEVEL

#### AC

Continuous power, +30 dBm (1 watt); 100 watts, 10  $\mu$ sec pulse into  $\geq 50$  dB attenuation.

#### DC

Input #1, 0 volt; Input #2,  $\pm 50$  volts.

### INPUT ATTENUATOR

70 dB range in 10 dB steps. Zero dB attenuation accessible only through numeric/unit keyboard.

Attenuation may be selected manually or coupled to reference level.

#### Accuracy

$\pm 1.0$  dB over 10 – 70 dB range.

## SPECIFICATIONS

---

### INPUTS (Cont'd)

#### EXTERNAL SWEEP TRIGGER INPUT (rear panel)

Must be  $>2.4$  volts (5 volt max).  $1\text{ k}\Omega$  nominal input impedance.

#### EXTERNAL FREQUENCY REFERENCE INPUT (rear panel)

Must equal  $10\text{ MHz} \pm 50\text{ Hz}$ ,  $0\text{ dBm}$  to  $+10\text{ dBm}$ ,  $50\text{ ohm}$  nominal input impedance. Analyzer phase noise performance will be degraded unless frequency reference phase noise and spurious signals are  $< -140\text{ dBc}$  single sideband (1 Hz) referred to  $10\text{ MHz}$  at a  $100\text{ Hz}$  to  $10\text{ kHz}$  offset.

**Quasi-Peak** (rear panel; nominal values)

**VIDEO INP:**  $0 - 2\text{ V}$ .  $139\Omega$  input impedance.

**IF INP:**  $21.4\text{ MHz}$ . Input is nominally  $-11\text{ dBm}$  with  $10\text{ dB}$  input attenuation.  $50\Omega$  input impedance.

### OUTPUTS

#### CALIBRATOR

$20\text{ MHz} \pm (20\text{ MHz} + \text{frequency reference error} \times \text{days since calibration})$ ,  $-10\text{ dBm} \pm 0.2\text{ dB}$ ;  $50\Omega$ .

#### PROBE POWER

$+15\text{ V}$ ,  $-12.6\text{ V}$ ;  $150\text{ mA}$  max.

Powers HP 1121A ac coupled (usable only with input #2) and HP 1120A dc coupled high impedance probes and HP 10855A Preamplifier.

#### AUXILIARY (rear panel; nominal values)

##### Display

X, Y and Z outputs for auxiliary CRT displays exhibiting  $<75\text{ nsec}$  rise times for X, Y and  $<30\text{ nsec}$  rise time for Z (compatible with HP 1300 series displays).

X, Y: 1 volt full deflection; Z: 0 to 1V intensity modulation,  $-1\text{ V}$  blank, BLANK output (TTL level  $>2.4\text{ V}$  for blanking) compatible with most oscilloscopes.

## SPECIFICATIONS

---

### OUTPUTS (Cont'd)

#### Recorder

Outputs to drive all current HP X-Y recorders (using positive pencoils or TTL penlift input).

**Horizontal Sweep Output (X axis):** A voltage proportional to the horizontal sweep of the frequency sweep generator that ranges from 0V for the left edge to +10V for the right edge. 1.7 k $\Omega$  output impedance.

**Video Output (Y axis):** Detected video output (before A-D conversion) proportional to vertical deflection of the CRT trace. Output increases 100 mV/div from 0 to 1V. Output impedance  $\leq 475\Omega$ .

**Penlift Output (Z axis):** A blanking output, 15V from 10 k $\Omega$ , occurs during frequency sweep generator retrace; during sweep, output is low at 0V with 10 $\Omega$  output impedance for a normal or unblanked trace (pen down).

LOWER LEFT and UPPER RIGHT pushbuttons calibrate the recorder sweep and video outputs with 0,0 and 10,1 volts respectively, for adjusting X-Y recorders.

#### 21.4 MHz IF

A 50 $\Omega$ , 21.4 MHz output related to the RF input to the analyzer. In log scales, the IF output is logarithmically related to the RF input signal; in linear, the output is linearly related. The output is nominally -20 dBm for a signal at the reference level.

Bandwidth is controlled by the analyzer's resolution bandwidth setting; amplitude is controlled by the input attenuator and IF step gain positions.

#### 1st LO

2 - 3.7 GHz, > +4 dBm; 50 $\Omega$  output impedance.

#### Frequency Reference

10.000 MHz, 0 dBm nominal; 50 $\Omega$  output impedance.

#### Quasi-Peak (rear panel: nominal values)

**VIDEO OUT:** 0 - 2V. 139 $\Omega$  input impedance.

**IF OUT:** 21.4 MHz. Output is nominally -11 dBm with 10 dB input attenuation. 50 $\Omega$  output impedance.

---

## **SPECIFICATIONS**

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### **INSTRUMENT STATE STORAGE**

Instrument state information is retained in memory for approximately 30 days in STANDBY mode or after line power is removed.

### **REMOTE OPERATION**

The standard HP 8568B operates on the Hewlett-Packard Interface Bus (HP-IB). All analyzer control settings (with the exception of VIDEO TRIGGER LEVEL, FOCUS, ALIGN, INTENSITY, FREQ ZERO, AMPTD CAL and LINE) are remotely programmable. Function values, marker frequency/amplitude, and traces may be output; CRT labels and graphics may be input.

#### **LCL**

Returns analyzer to local control, if not locked out by controller.

## SPECIFICATIONS

---

### OPTIONS

All specifications are identical to the standard HP 8568B except as noted.

#### **75 $\Omega$ INPUT IMPEDANCE** (Option 001)

##### **RF Input #1**

100 Hz to 1500 MHz, 75 $\Omega$ , BNC connector; dc coupled. Not fused.

##### **Residual Responses**

< -99 dBm, RF Input #1.

##### **Average Noise Level**

Noise level displayed on RF input #1 < -129 dBm with 10 Hz resolution bandwidth, frequencies >1 MHz; < -106 dB for frequencies  $\leq$ 1 MHz but >500 Hz. (0 dB input attenuation, 1 Hz video filter.)

#### **400 Hz POWER LINE FREQUENCY OPERATION**

(Option 400)

##### **Line Related Sidebands**

>75 dB below peak of CW signals.

##### **Power Requirements**

400 Hz  $\pm$  10% line frequency: 100 or 120 volts (+ 5%, - 10%) line voltage; 50 - 60 Hz power line frequency for service only, not for extended periods.

##### **Residual Responses** (no signal at input)

< -95 dBm for frequencies >500 Hz; < -105 dBm for frequencies >2.5 kHz. 0 dB input attenuation.

##### **Temperature Range** (Operating)

50 - 60 Hz, 5° to 35°C; 400 Hz, 5° to 55°C.

## **SPECIFICATIONS**

---

### **GENERAL**

#### **ENVIRONMENTAL**

##### **Temperature**

Operating: 0° to 55°C; Storage: -40°C to +75°C.

#### **EMI**

Conducted and radiated interference is within the requirements of Class A1c, REO2 of MIL STD 461B, and within the requirements of VDE 0871 and CISPR publication 11.

#### **WARM-UP TIME**

##### **Frequency Reference**

Frequency reference aging rate attained after 30 day warm-up from cold start at 25°C. Frequency is within  $1 \times 10^{-8}$  of final stabilized frequency within 30 minutes.

##### **Operation**

Requires 30 minute warm-up from cold start, 0° - 55°C.

##### **Internal Temperature Equilibrium**

Reached after 2 hr. warm-up at stabilized outside temperature.

#### **POWER REQUIREMENTS**

50 - 60 Hz; 100, 120, 220 or 240 volts (+ 5%, - 10%); approximately 450 VA (40 VA in standby).

400 Hz operation is available as Option 400.

#### **WEIGHT**

**Net:** Total, 45 kg (100 lb); IF-Display Section, 21 kg (47 lb); RF Section 24 kg (53 lb).

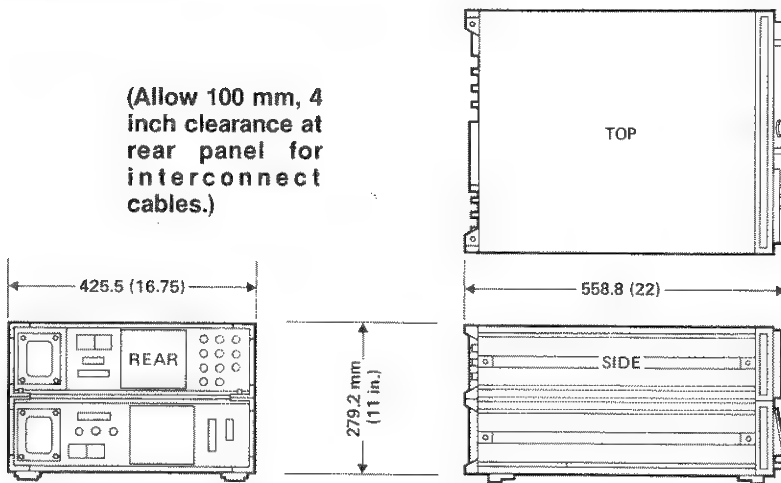
**Shipping:** IF-Display Section, 27 kg (60 lb); RF Section 32 kg (70 lb).

## SPECIFICATIONS

### GENERAL (Cont'd)

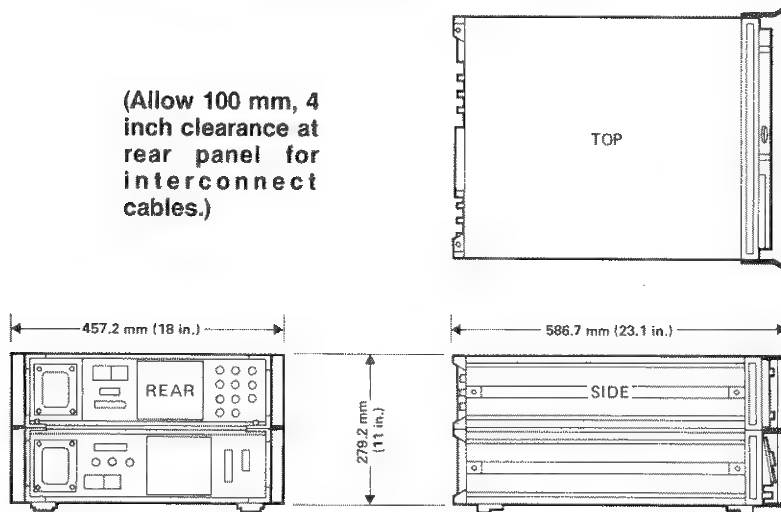
#### DIMENSIONS

(Allow 100 mm, 4 inch clearance at rear panel for interconnect cables.)



INSTRUMENT DIMENSIONS WITHOUT HANDLES

(Allow 100 mm, 4 inch clearance at rear panel for interconnect cables.)



INSTRUMENT DIMENSIONS WITH HANDLES



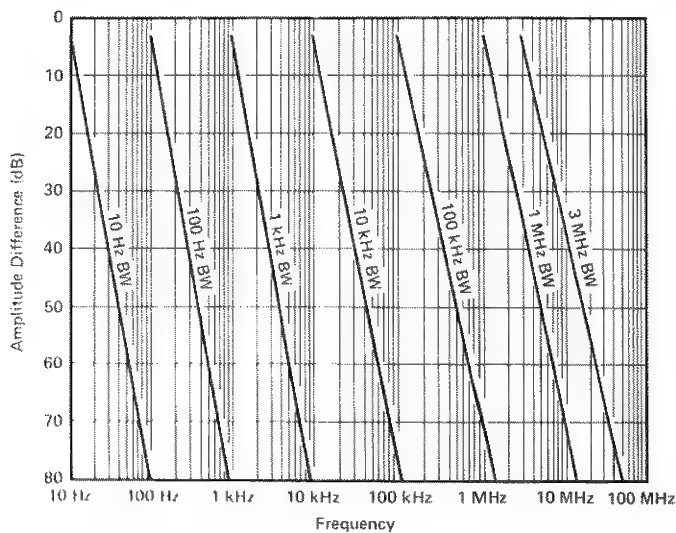
## PERFORMANCE CHARACTERISTICS

### FREQUENCY

**Frequency Span:** Variable from data knob or from numeric/unit keyboard, in approximately 1% increments.

**Center Frequency:** Variable from data knob or from numeric/unit keyboard in approximately 1% increments. Center frequency step size is normally 10% of frequency span.

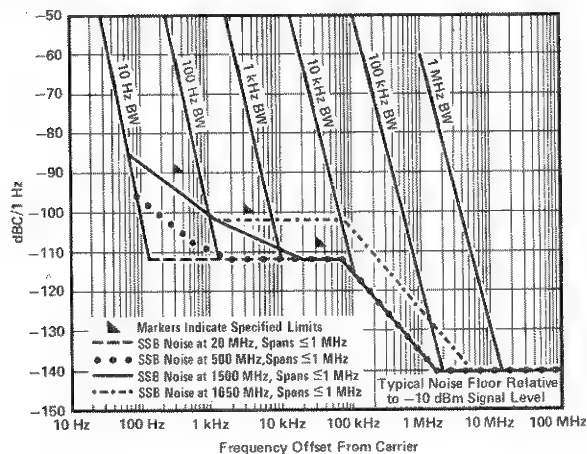
### Resolution



TYPICAL SPECTRUM ANALYZER RESOLUTION

## PERFORMANCE CHARACTERISTICS

### Spectral Purity



TYPICAL SSB NOISE VS. OFFSET FROM CARRIER

### AMPLITUDE

**Reference Level:** Signals at the reference level in log translate to approximately full scale signals in linear typically within  $\pm 1$  dB at room temperature.

**Frequency Response (Flatness) Uncertainty:**  $\geq 10$  dB RF Attenuation

**Input 1:**  $\pm 0.75$  dB 100 Hz to 500 MHz;  $\pm 1.0$  dB 100 Hz to 1500 MHz; +1, -4 dB 1500 MHz to 1650 MHz.

**Input 2:**  $\pm 0.7$  dB 100 kHz to 1500 MHz; +1, -4 dB 1500 MHz to 1650 MHz.

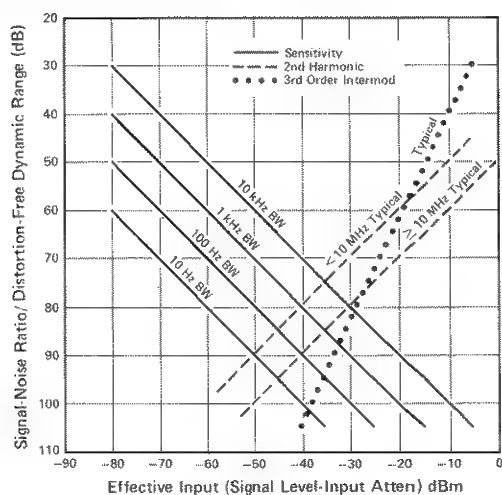
**Residual Responses** (Input terminated with 50 $\Omega$  0 dB input attenuation):

500 Hz to 1500 MHz:  $< -105$  dBm

100 Hz to 500 Hz:  $< -105$  dBm except for line related residuals and LO feedthru skirt (in the 100 Hz - 110 Hz range), typically  $< -100$  dBm.

## PERFORMANCE CHARACTERISTICS

### Third Order Intermodulation Distortion

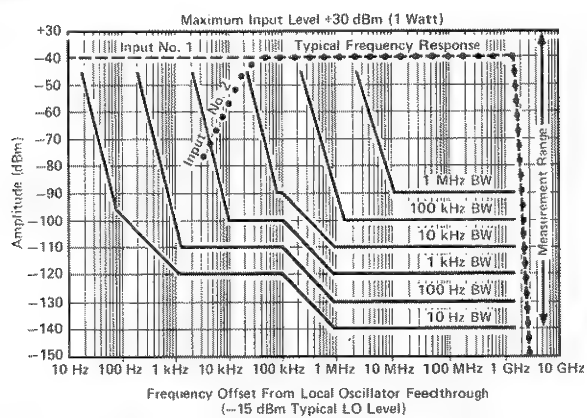


OPTIMUM DYNAMIC RANGE

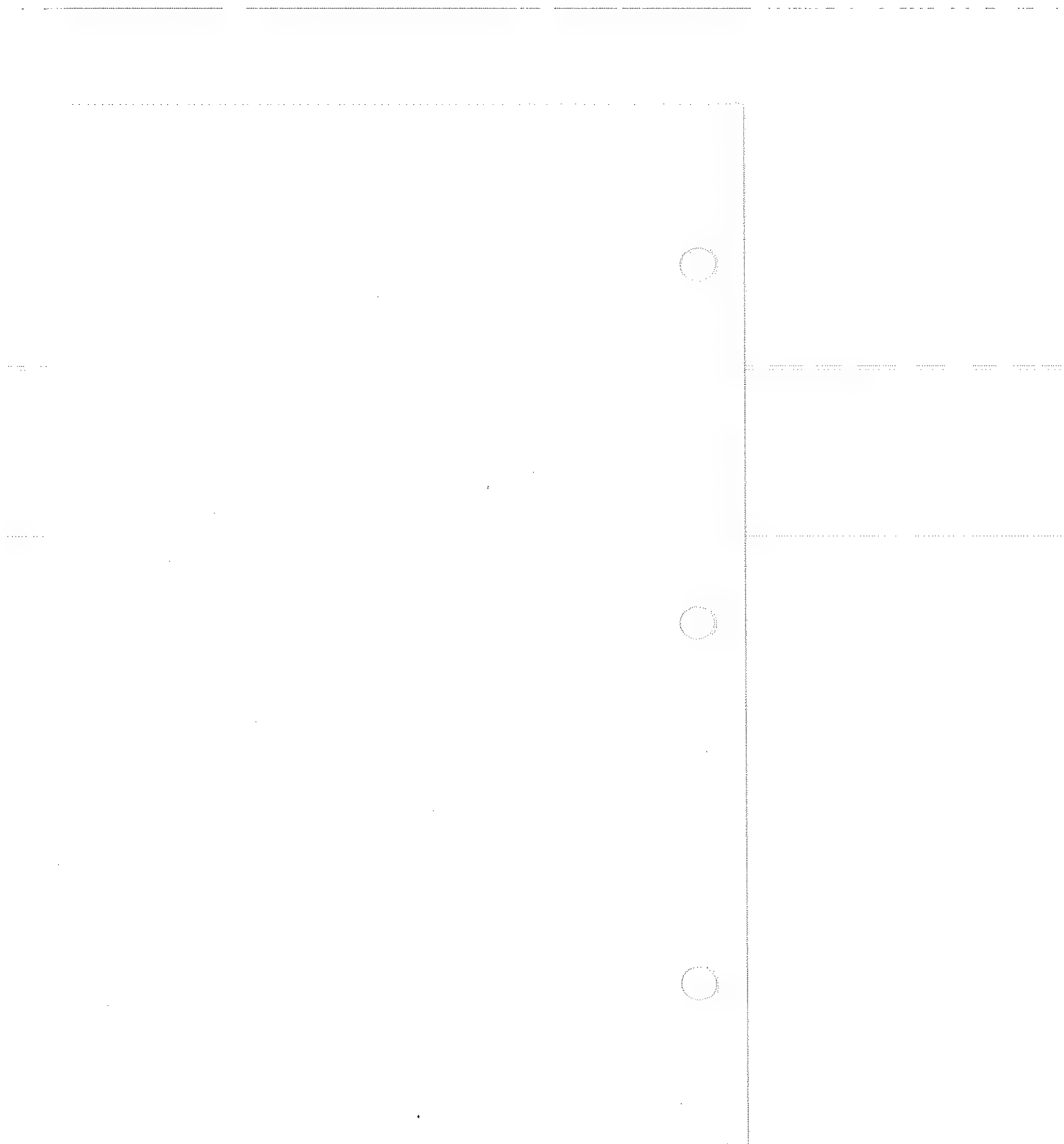
INPUT

LO emission is typically  $< -75$  dBm (0 dB RF ATTEN).

### Average Noise Level



TYPICAL SENSITIVITY VS. INPUT FREQUENCY





**HEWLETT  
PACKARD**

## **OPERATION VERIFICATION**

# **8568A/B SPECTRUM ANALYZER**

**Includes Options 001 and 400**

## **SERIAL NUMBERS**

This manual applies directly to all HP Model 8568A and 8568B RF Spectrum Analyzers.

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1212 VALLEY HOUSE DRIVE  
ROHNERT PARK, CALIFORNIA 94928, U.S.A.**

<b>HP Part Number</b>	<b>Description</b>
08568-90074	Manual
08568-90077	Microfiche
08568-60008	Manual with discs

**Printed: NOVEMBER 1986**

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# OPERATION VERIFICATION

## INTRODUCTION

Operation Verification is an automatic performance test designed to give a high confidence level in the operation of the HP Model 8568A/B Spectrum Analyzer in a reasonable time. It performs 85 % to 90 % of the manual performance tests in approximately 1 hour and is designed to test an instrument operating within a temperature of range 20° to 30° C. Refer to Table 1 for a list of tests performed.

Passing Operation Verification assures that the spectrum analyzer is performing within the specifications tested. Other results indicate the need to perform the related manual test, located in the HP 8568B Tests and Adjustments Manual (HP part number 08568-90051), or in Section IV of the HP 8568A Operating and Service Manual (HP part number 08568-90012). A cross reference to each related manual test is given in the individual test description.

Operation Verification can be used to test the majority of the manual performance tests for a performance verification. Listed in Table 2 are the additional manual tests required.

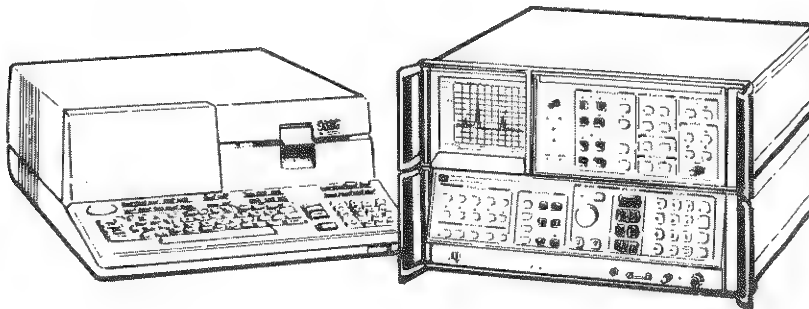


TABLE 1. TESTS PERFORMED

Test Number and Name	Equipment
1. Input Attenuator Switching Uncertainty	HP 3335A
2. IF Gain Uncertainty	HP 3335A
3. Scale Fidelity (Log)	HP 3335A
4. Scale Fidelity (Linear)	HP 3335A
5. Log Scale Switching Uncertainty	HP 3335A
6. Resolution Bandwidths	NONE
7. Line Related Sidebands	NONE
8. Residual FM	NONE
9. RF Gain Uncertainty	NONE
10. Sweep Time Accuracy	NONE
11. Average Noise Level	HP 909A, Option 012
12. Residual Responses	HP 909A, Option 012
13. Frequency Span Accuracy	HP 8340A or HP 3335A
14. Frequency Response	HP 8340A and HP 3335A or HP 8444A Option 059 HP 8902A or HP 436A or HP 438A HP 8482A HP 11667A
15. Second Harmonic Distortion	HP 3335A HP Part Number 0955-0306
16. Third Order Intermodulation Distortion	HP 8340A HP 3335A HP 8721A HP Part Number 0955-0306 (2)
17. Calibrator Output Amplitude Accuracy	HP 8902A or HP 436A or HP 438A HP 8482A

## 2 Operation Verification



TABLE 2. TESTS NOT PERFORMED

Center Frequency Readout Accuracy  
Noise Sidebands  
Fast Sweeptime  
Time Base Drift

TABLE 3. TEST EQUIPMENT SUMMARY

HP Part Number	Equipment
HP Series 200/300 Computer	Controller*
HP 3335A	Frequency Synthesizer
HP 8340A or HP 8341A or HP 8444A, Option 059	Synthesized Sweeper Tracking Generator
HP 436A, or HP 438A or HP 8902A	Power Meter Measuring Receiver
HP 8482A	Power Sensor
HP 909A, Option 012	50 Ohm Termination
HP P/N 0955-0306	50 MHz Lowpass Filter
HP 11667A	Power Splitter
HP 8721A	Directional Bridge
HP-IB Printer	
Miscellaneous Cables and Adapters	
*750K of free memory is required for the test program.	

---

## TEST SYSTEM CONFIGURATION

The Operation Verification program requires an HP Series 200 or 300 computer with HP BASIC 2.0 and Extensions 2.1 or Basic 3.0/4.0. The program operates on either a single or dual bus configuration; the dual bus system is used with the Microwave Test Set (MTS). The HP 9816 operates only on the single bus, while the HP 9826 and 9836S operate on either single or dual bus systems. For a dual bus system it is also necessary to have an HP Model 98624A HP-IB Interface to connect the test instrument to the computer (as shown in Figure 1).

The Operation Verification software is designed to operate on the dual bus (MTS) system. In this configuration the bus with the test equipment has a select code of 7, while the bus with the unit under test has a select code of 8. The software will adapt itself to a single bus system if a 98624A HP-IB Interface at select code 8 is not present.

The equipment needed to perform the HP 8568A/B Operation Verification is listed in both Tables 1 and 3. Table 1 includes a test-by-test listing of the equipment needed and Table 3 a test equipment summary. To obtain a permanent record of the test results an HP-IB printer is required. The HP 8568A/B CRT display may be selected to display the test results if a permanent test record is not desired.

### NOTE

**As a change of the results for each test is expected over a period of time, Hewlett-Packard warrants only the specification range and not the repeatability of the data for any given specification.**

## EQUIPMENT CONNECTIONS

Set up the HP Series 200 or 300 Computer following the instructions in Chapter 1, "Computer Installation," in the BASIC Operating Manual (HP Part Number 09826-90000) for Series 200, or The Configuration Reference Manual (HP Part Number 98561-90020) for Series 300.

For the Dual Bus configuration (MTS) connect the test equipment connect as shown in Figure 1. The instrument under test is connected to the HP 98624A Interface card.

For a single bus system connect the HP-IB by attaching one end of an HP-IB cable to the connector on the rear panel of the computer and the other end of the cable to the connector on the rear panel of the HP 8568A/B (refer to Figure 2). Connect the other listed test equipment to the HP-IB using additional cables as necessary.

Turn the HP 8568A/B line power on and allow a 30 minute warm-up. Also, allow sufficient warm-up time for the other test equipment as indicated in the individual operating and service manuals.

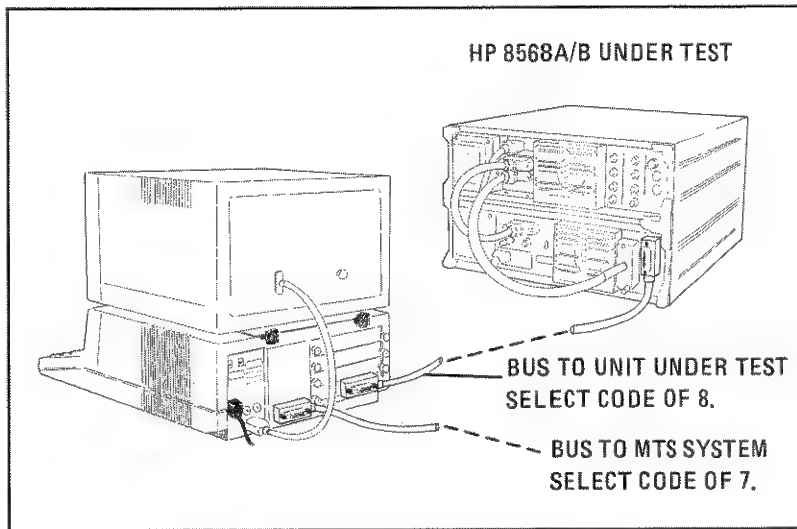


FIGURE 1. DUAL BUS (MTS) SYSTEM CONNECTION

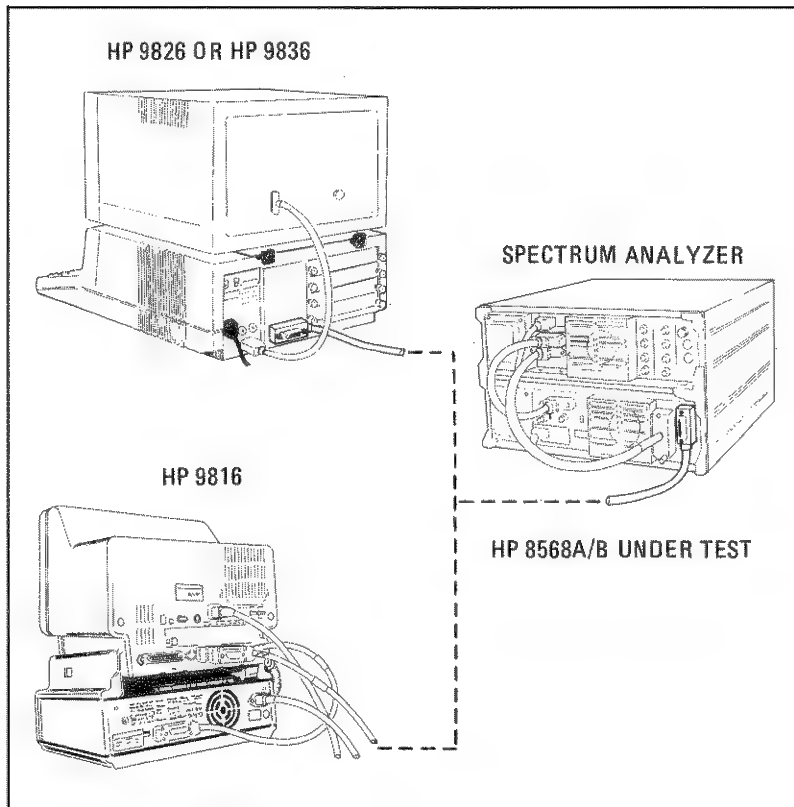


FIGURE 2. SINGLE BUS SYSTEM CONNECTION

## PROGRAM LOADING

Load the BASIC language into the computer. Possible language options are:

- BASIC 2.0 and Extensions 2.1
- BASIC 3.0 or 4.0 which must include the following binaries:
  - MAT 3.0 or 4.0
  - IO 3.0 or 4.0
  - GRAPH 3.0 or 4.1
  - PDEV 3.0 or 4.0
  - HPIB 3.0 or 4.0

---

For configuration instructions, refer to the BASIC Operating Manual. Next, insert the disc containing the Operation Verification software and type:

**LOAD "VERIFY\_68",1**

and press the EXECUTE key. The software will load and begin to run.

### PROGRAM OPERATION

The initial displays are designed to assist you in configuring the software to meet your needs. Each display lists the various options and the appropriate responses. The LIST OF DEFAULTS display deserves special mention because it is here that the choice of power meters must be made. If the power meter listed in the display does not match your configuration, enter the model number on the correct line and

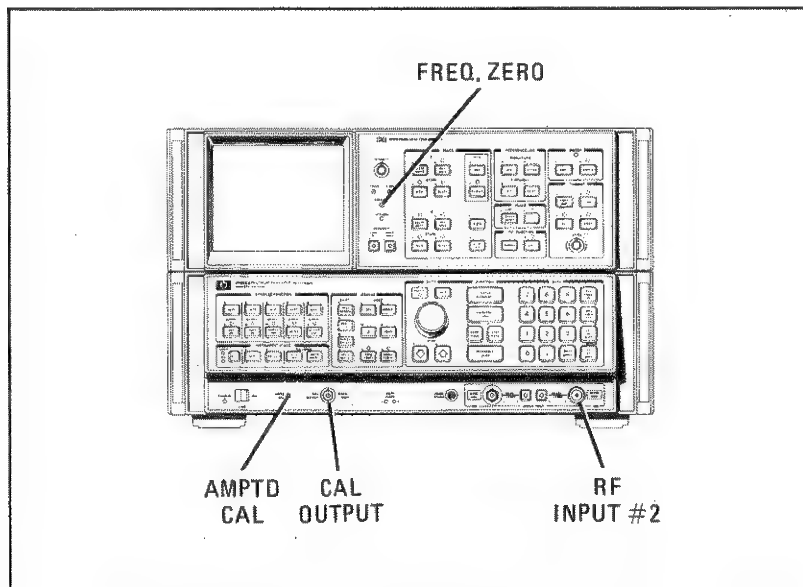


FIGURE 3. RF INPUT AND CALIBRATION CONTROLS

software will use this throughout Operation Verification. This display is also the entry screen for HP-IB addresses. If the test equipment on the bus does not agree with the addresses shown, the software will allow the user to return to this display and change the addresses.

## HP-IB ADDRESSES

Table 4 lists the assigned addresses of the test equipment on the HP-IB. For dual bus configuration the select code for the test equipment is 7 and the select code for the instrument under test is 8. (The address for the HP 8568A/B under test is 818.)

In the single bus configuration the select code for the test equipment is 7, and the select code for the instrument under test is 7.

TABLE 4. HP-IB ADDRESSES

Equipment	HP Model	Address
Controller	HP 9816 or HP 9836S	21
Frequency Synthesizer	HP 3335A	04
Synthesized Sweeper	HP 8340A	19
Power Meter	HP 436A or 438A	13
Measuring Receiver	HP 8902A	14
HP-IB Printer	HP 82906A (Recommended)	01

## ERROR MESSAGES

Self-explanatory error messages are incorporated into the Operation Verification program to assist you in identifying errors.

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## TEST DESCRIPTIONS

The following test descriptions list the Specification, Related Performance Test, and Test description for each test performed by the Operation Verification program. The specifications listed below are those of each Operation Verification test and are uncorrected (where applicable). Operation Verification is designed to test an instrument operating within a temperature range of 20° to 30° C.

### 1. INPUT ATTENUATOR SWITCHING UNCERTAINTY

#### Specification:

$\pm 1.0$  dB over 10 to 70 dB range

#### Related Performance Test:

#### INPUT ATTENUATOR SWITCHING UNCERTAINTY TEST

#### Description:

A signal source of known amplitude is connected to the spectrum analyzer and the analyzer is adjusted for a reference. The input attenuator is stepped down from 10 dB to 70 dB, while the reference level and the signal source are stepped up. This maintains the signal peak at the same approximate location on the CRT display. The amplitude of the signal is measured at each step using the marker function on the analyzer.

---

## 2. IF GAIN UNCERTAINTY

### Specification:

0.0 dBm to -55.9 dBm;  $\pm 0.6$  dB  
-56.0 dBm to -129.9 dBm;  $\pm 1.0$  dB

### Related Performance Test:

IF GAIN UNCERTAINTY TEST

### Description:

A signal source of known amplitude is connected to the spectrum analyzer and the analyzer is adjusted for a reference level. The amplitude of the signal peak is measured in 0.1 dB steps from -0.1 dB to -1.9 dB, in 2 dB steps from -1.9 dB to -9.9 dB, and in 10 steps from -10 dB to -120 dB.

## 3. SCALE FIDELITY (Log)

### Specification:

$\leq \pm 1.0$  dB over 0 to 80 dB display  
 $\leq \pm 1.5$  dB over 0 to 90 dB display

### Related Performance Test:

AMPLITUDE FIDELITY TEST

### Description:

The specification listed is for cumulative error. Only cumulative error is measured in this procedure.

A signal source of known amplitude is connected to the spectrum analyzer and the analyzer is adjusted for a reference. The signal source is stepped down in 1 dB steps and the displayed signal amplitude on the analyzer measured at each step. This measurement is performed in both the 3 kHz and 300 kHz bandwidths.



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#### **4. SCALE FIDELITY (Linear)**

##### **Specification:**

$\pm 3\%$  of Reference Level

##### **Related Performance Test:**

AMPLITUDE FIDELITY TEST

##### **Description:**

A signal source of known amplitude is connected to the spectrum analyzer and the analyzer is adjusted for a reference. The signal source is stepped down from  $-10$  dB to  $-30$  dB in 10 dB steps and the amplitude of the displayed signal measured using the marker function. This measured value is used to calculate the percent error from the reference level established.

#### **5. LOG SCALE SWITCHING UNCERTAINTY**

##### **Specification:**

$\pm 0.5$  dB

##### **Related Performance Test:**

LOG SCALE SWITCHING UNCERTAINTY TEST

##### **Description:**

A signal source of known amplitude is connected to the spectrum analyzer and the analyzer is adjusted for a reference in 1 dB per division Log. The analyzer is then switched to each of the other LOG scales (2 dB, 5 dB, and 10 dB) and the amplitude of the signal peak is measured at each setting.

---

## 6. RESOLUTION BANDWIDTHS

### Specification:

Bandwidth: 3 MHz to 10 Hz;  $\pm 20\%$   
1 MHz to 3 kHz;  $\pm 10\%$

Amplitude: (Referenced to 1 MHz amplitude)  
3 MHz;  $\pm 1.0$  dB  
1 MHz to 100 Hz;  $\pm 0.5$  dB  
30 Hz;  $\pm 0.8$  dB  
10 Hz;  $\pm 2.0$  dB

Selectivity: (60 dB/3 dB ratio)  
3 MHz to 100 kHz;  $< 15:1$   
30 kHz to 10 kHz;  $< 13:1$   
3 kHz to 30 Hz;  $< 11:1$   
10 Hz:  $< 100$  Hz separation of 60 dB points

### Related Performance Test:

RESOLUTION BANDWIDTH ACCURACY TEST  
RESOLUTION BANDWIDTH SELECTIVITY TEST  
RESOLUTION BANDWIDTH SWITCHING UNCERTAINTY TEST

### Description:

A signal source is connected to the spectrum analyzer input. The analyzer steps through the bandwidths from 3 MHz to 10 Hz, centers the signal, sets signal peak near the reference level, and measures the frequency of the 3 dB points for each bandwidth. The 3 dB bandwidth is then calculated by determining the difference in frequency between the 3 dB points.

Next the spectrum analyzer steps through the bandwidths and measures the frequency of the 60 dB points of each bandwidth. The 60 dB bandwidth is then calculated by determining the frequency difference between the 60 dB points.

The shape factors are calculated by dividing the 60 dB bandwidths by the 3 dB bandwidths.

---

## 7. LINE RELATED SIDEBANDS

### Specification:

85 dB below the peak of a CW signal (Option 400: >75 dB)

### Related Performance Test:

LINE RELATED SIDEBANDS TEST

### Description:

A signal source is connected to the spectrum analyzer input and the necessary front panel control settings made for the test. The harmonics of the line frequency are calculated, the front panel controls set to view the frequencies, and measure the amplitude of the signal at each of the frequencies.

## 8. RESIDUAL FM

### Specification:

Less than 3 Hz peak-to-peak for sweep time  $\leq 10$  sec; span  $< 100$  kHz; resolution bandwidth  $\leq 30$  Hz, video bandwidth  $\leq 30$  Hz

### Related Performance Test:

RESIDUAL FM TEST

### Description:

A signal source is connected to the spectrum analyzer input and the required front panel control settings are made as stated in the specification.

The slope of the signal is measured for use in calculating the residual FM.

The signal is centered on the display and the peak-to-peak amplitude deviation of the signal measured. The frequency deviation is the result of the amplitude deviation being divided by the slope (measured earlier in the test).

---

## 9. RF GAIN UNCERTAINTY

### Specification:

RF Gain Uncertainty Due to Second LO shift:  $\pm 1.0$  dB (uncorrected)

### Related Performance Test:

RF GAIN UNCERTAINTY TEST

### Description:

A signal is connected to the spectrum analyzer SIGNAL INPUT and the analyzer front panel controls set to view the signal. The 2nd LO is shifted up. The marker functions are used to measure the change in amplitude. The change corresponds to the difference in the signal level between the 2nd LO shifted up and the 2nd LO shifted down.

## 10. SWEEP TIME ACCURACY

### Specification:

Sweep time  $\leq 100$  sec;  $\pm 10\%$

Sweep time  $> 100$  sec;  $\pm 20\%$

### Related Performance Test:

SWEEP TIME ACCURACY TEST

### Description:

An internal measurement function is used to measure the sweep time at 20 msec, 750 msec, 5 sec, 30 sec, 200 sec, and 1500 sec. These sweep times check all of the sweep time multipliers in the Sweep Generator Current Source circuit (A22 Frequency Control). Sweep start-up time (offset) is measured and subtracted from the measured sweep time. The measured sweep time is compared to the selected sweep time and the percent error calculated.

---

## 11. AVERAGE NOISE LEVEL

### Specification:

Displayed:  $< -135$  dBm for frequencies  $> 1$  MHz,  $< -112$  dBm for frequencies  $\leq 1$  MHz but  $> 500$  Hz with 10 Hz resolution bandwidth, 0 dB input attenuation, 1 Hz video filter.

### Related Performance Test:

#### AVERAGE NOISE LEVEL TEST

### Description:

The signal input of the spectrum analyzer is terminated with a 50 ohm load or the synthesizer and the analyzer attenuator. The necessary front panel control settings are made and the average noise level measured at 501 Hz, 1001 MHz, and 1501 MHz.

## 12. RESIDUAL RESPONSES

### Specification:

$-105$  dBm, with 0 dB input attenuation

### Related Performance Test:

#### RESIDUAL RESPONSES TEST

### Description:

The signal input of the spectrum analyzer is terminated with a 50 ohm load or the synthesizer and the analyzer attenuator. The peak amplitude of the noise or responses is measured at various frequencies associated with residual responses caused by harmonics and mixing products of the First, Second, and Third local oscillators, the internal reference, and the HP-IB and digital storage clocks.

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### 13. FREQUENCY SPAN ACCURACY

#### Specification:

For spans  $> 1$  MHz;  $\pm(2\%$  of the actual frequency separation,  $+0.5\%$  of span setting)

For spans  $\leq 1$  MHz;  $\pm(5\%$  of the actual frequency separation,  $+0.5\%$  of span setting)

#### Related Performance Test:

#### FREQUENCY SPAN ACCURACY TEST

#### Description:

A stable signal source is connected to the spectrum analyzer and the analyzer center frequency and span is set to measure spans of 10 kHz to 1 GHz in 1, 2, 5 sequence.

### 14. FREQUENCY RESPONSE

#### Specification:

INPUT #1:  $\pm 1.0$  dB, 100 Hz to 500 MHz with  $\geq 10$  dB RF Attenuation

$\pm 1.5$  dB, 100 Hz to 1500 MHz with  $\geq 10$  dB RF Attenuation

INPUT #2:  $\pm 1.0$  dB, 100 kHz to 1500 MHz with  $\geq 10$  dB RF Attenuation

#### Related Performance Test:

#### FREQUENCY RESPONSE TEST

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**Description:**

If available, synthesizers are used to supply an input signal for the analyzer. If not, the spectrum analyzer rear panel 1ST LO OUTPUT is connected to a tracking generator which supplies the input signal for the analyzer. A power meter and a tracking generator are connected to a power splitter, which in turn is connected directly to the SIGNAL INPUT connector of the analyzer.

The signal amplitude is measured from 1 MHz to 1500 MHz in 20 MHz increments and compared to the measured value of the input signal indicated by the power meter. This procedure is performed for both input connectors. The operator is asked to make the new connection to the other input connector mid-way through the test.

**15. SECOND HARMONIC DISTORTION**

**Specification:** (For mixer level  $\leq -30$  dBm)

$< -60$  dBc, 100 Hz to 10 MHz

$< -70$  dBc,  $> 10$  MHz

**Related Performance Test:**

HARMONIC AND INTERMODULATION DISTORTION

**Description:**

A 40 MHz signal is applied to the analyzer RF INPUT through a 50 MHz Low Pass Filter. The spectrum analyzer is adjusted to measure the second harmonic at 80 MHz.

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## **16. THIRD ORDER INTERMODULATION DISTORTION**

### **Specification:**

Intercept is greater than +5.0 dBm from 100 kHz to 10 MHz and greater than +10 dBm from 10 MHz to 1500 MHz

### **Related Performance Test:**

HARMONIC AND INTERMODULATION DISTORTION TEST

### **Description:**

Two signals with 10 kHz and 1 MHz separation are applied to the First Mixer. The frequencies of third order intermodulation products are calculated and the spectrum analyzer is set to measure the amplitude of these responses. The third order intercept is calculated from the measurements for each separation.

## **17. CALIBRATOR OUTPUT AMPLITUDE ACCURACY**

### **Specification:**

-10 dBm,  $\pm 0.2$  dB

### **Related Performance Test:**

CALIBRATOR OUTPUT AMPLITUDE ACCURACY TEST

### **Description:**

The power sensor is connected to the analyzer CAL OUTPUT and the power is measured.





